DAILY EDITION
Nineteenth Year

Railway Age

AND RAILWAY REVIEW

Railway Engineering and Maintenance Railway Signaling

Chicago—TUESDAY, MARCH 6, 1928

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Railway Engineering and Maintenance · Railway Signaling
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A Successful Year

WHEN President Brumley calls the A. R. E. A. convention to order this morning, he will approach the end of one of the most successful years in the history of this organization. While his administration has not been characterized by the introduction of any radical innovation in procedure or the launching of any spectacular undertakings, it is doubtful if there has ever been a year in which there has been any more intensive development in the organization. While it is not possible or desirable to give any consideration to the proximity of residence of an officer of the association to the headquarters of the organization, the fact that Mr. Brumley has resided in Chicago has permitted him to be in almost daily touch with the association's office and has made possible a rapidity of action and a co-operation with the secretary that is not otherwise possible. Combined with this advantage of location there has been a willingness to give freely of his time which has resulted in the intensive direction of the work to its great advantage. When President Brumley hands the gavel over to his successor on Thursday, he can do so with the knowledge that the association's affairs are on a higher plane than ever.

Convention Procedure

AT THE concluding session of the last annual convention of the A. R. E. A. the association passed a resolution introduced by L. A. Downs, past president, instructing the board of direction to review suggestions that had been made regarding changes in the convention procedure, thereby giving recognition to the criticisms made by the Committee on Records and Accounts at the opening session and ruled out of order at that time. The Board of Direction complied with these instructions by appointing a committee of its members immediately after the close of the convention to consider these and other suggestions. This committee has been most thorough in its work and has made sincere efforts to ascertain the will of the association. Early in the year it addressed a questionnaire to the standing committees, thereby bringing to its aid the thought of more than 700 of the most active members of the organization. It then sent a similar questionnaire to the membership at large, in this way offering an opportunity for every member to submit any suggestions which he believed would tend to improve the value of the work. That the rapid growth of the association and the amount of work it is doing in recent years have introduced problems is no longer open to argument. The crowded condition of the programs in past years bears evidence to this fact. The solution of the problem is not so easy, however, and the committee has received a wide variety of suggestions which it has weighed carefully. From these suggestions it has endeavored to formulate what appears to be the consensus of the entire membership into a report which it presented to

the Board of Direction Monday, which report was approved for printing and distribution among the members. It is understood that this will be done before the convention adjourns and that opportunity will be afforded for the discussion of this subject at the business session Thursday afternoon. While the report prepared by the committee has not yet been made public and the conclusions of the committee are not therefore available for discussion and while it would be surprising if it or any other report would meet with the unanimous approval of as large a membership as that of the A. R. E. A., it may be said that no committee of the association has ever undertaken a more monumental task or has ever made a more thorough survey of the association's activities. This report, therefore, deserves a sympathetic reading by every member because it represents the conclusions of an exceedingly thorough survey of association interest.

Will There Be More Discussion?

ONE of the most pronounced improvements which the A. R. E. A. has ever made in the conduct of its affairs is the recently adopted provision for overlapping the terms of committees from year to year. By this means a committee is virtually authorized to launch upon its work for the new year as soon as it has turned in its report for the current year. This has resulted in advancing the committtee work fully three months and should make it possible for the committees to do hereafter what they have done this year—turn in their report in ample season to have them printed well in advance of the convention. The last bulletin was in the hands of all members at least four weeks ago. This fact removes one influence that has tended to discourage discussion in the past. If each member has had ample time to read the bulletins before coming to the convention, there can be no excuse on the score of inadequate preparation. It will be interesting to observe the effect of this improved service to the members. If it does not lead to more general discussion, it means either that delayed delivery of reports in the past has been an excuse rather than a reason for limited comment on reports, or that the lack of general discussion must be otherwise explained.

An Opportunity Not to Be Overlooked

THE railway signal exhibit, one of the features of the Baltimore & Ohio centenary exhibition at Halethorpe, Md., last year, has been brought to Chicago and is being shown at the annual meeting of the American Railway Association, Signal Section, which opened yesterday at the Stevens Hotel. The B. & O. exhibit is a pictorial story of signal development from the crude signals of 1834 to the present day semaphore, color-light, position-light, and color-position-light signals employed in automatic signal territory. Aside from its historical interest, the B. & O. exhibit presents in a striking way the economic advantages of modern automatic block signals, power interlockers, remote power switches, train operation by signal indication, car retarders, highway crossing signals and automatic train control. This exhibit is a tribute to the painstaking efforts of the men who have labored to make it so effective that it has been believed worth while to make it a permanent exhibit. The Signal Section invites all interested railway officers to visit this worthwhile exhibit which is located in the North Assembly Room of the Stevens Hotel, adjacent to the room in which the Signal Section meetings are being held.

Saving Labor in Track Work

ONE FEATURE of the exhibit at the Coliseum which must greatly impress every close observer is the number of new devices and machines being shown that are designed to save labor in track work. It does not seem many years since the work involved in laying and maintaining tracks and structures was done almost entirely by human labor and small tools which labor could easily handle. That day is past, and there is now hardly anything done in connection with the laying, improvement or maintenance of track for which some device or machine that eliminates most of the human labor has not been invented and placed on the market; and the number of such devices and machines increases each year.

The aggregate amount of labor saved by them is enormous, although it cannot be accurately measured. There has not been any large reduction in the total number of track laborers employed during recent years. The saving effected is indicated by the fact that the track of most railways has been greatly strengthened, improved, and, to a large extent, reconstructed with relatively little increase in the amount of labor employed while this has been going on. That, without the remarkable development that has occurred in labor-saving devices, there would have been necessary a large increase in the amount of labor employed to do what has been done, there can be no serious question.

The increased used of labor-saving devices has both engineering and economic aspects of much interest. It shows that there is at least as much inventive genius among those who sell or desire to sell, in the railroad market as ever before, and that railway engineers are as quick to recognize the value of improved devices and machinery adopted as they ever were. It also serves to explain why, in spite of the increasing restrictions that have been placed upon immigration, the railways in most parts of the country have apparently suffered even less from the lack of track labor than they formerly did.

Directly and indirectly the service of railroad transportation is constantly being rendered relatively more largely by capital and less largely by labor. Between 1916 and 1926 the number of hours of all labor for which the railways paid declined ten per cent. In the same decade the capital invested in their properties increased almost forty per cent. These figures sufficiently demonstrate that the increased traffic was handled by increased capital and not by increased labor. It might be thought that the part of this increased capital invested in devices and machinery to save labor in track work was comparatively small, but it is authoritatively estimated that the railways now have invested close to a half billion dollars in labor-saving machinery of this kind alone. Through saving labor it is effecting a saving in operating expenses, which, without doubt, must be at least several times the fixed charges upon the capital invested in it.

A Method of Standardizing Highway Crossing Signals

AT THE annual convention of the Signal Section, A.R.A. in March, 1925, the Committee on Highway Crossing Protection presented a specification for automatic highway crossing signals which was later adopted by letter ballot and approved by the American Railway Association. This specification authorized an aspect reading: "When indicating the approach of a train, the appearance of a horizontal swinging red light and/or disc." In brief this included either the alternate flashing-light signal or the wig-wag type. In the eastern part of the United States the alternate flashing-light type of crossing signal evidently has the approval of the majority of the local and state authorities, and other governing bodies. Throughout the western part of the country the wig-wag seems to be preferred, and California has recently passed a law standardizing the wig-wag.

If the East as a whole adopted the flashing-light and the West the wig-wag, with a definite boundary between the two areas such as the Mississippi river, perhaps the problem could be thus solved with these United States divided on this question of what a highway crossing signal should be. However, the automobile tourists see wig-wags in Virginia and Maine as well as in California. In IIllinois and other mid-western states wig-wag or flashing lights are used indiscriminately, depending upon the preference of the railroad or the local city authorities. Obviously the automobile tourist is confused to know just what a signal does indicate, the location of a crossing or when a train is approaching.

If the Signal Section has seen fit to adopt two standards, of which any state can adopt either or both, when will the confusion end? The solution was suggested by C. H. Tillet, chairman of the Signal Section, in his annual address Monday. He states that the Board of Railroad Commissioners has adopted the wig-wag as standard for the Dominion of Canada. Although Mr. Tillett made no statement favoring either the wig-wag or the flashing light he pointed out that in the interest of standardization and for the benefit of automobile tourists, some action should be taken that will bring about a single standard in the United States. This result has not been accomplished by the Signal Section nor will it ever be accomplished by the different states, working independently. Mr. Tillet, therefore, suggests that some federal government body such as the Interstate Commerce Commission, make a study of the problem and establish a standard for future installations. This is a most logical idea and it is to be hoped that the Interstate Commerce Commission will give it consideration. In the meantime the advocates of the wig-wag and of the flashing-light crossing signals will be assembling arguments in support of their types. Such a fight to a final finish will be the only method of establishing a real standard for highway crossing signals in the United States.

Announcements

Signal Section Program

Committee VIII—Alternating Current Automatic Block Signaling.
Committee V—Instructions.
Committee X—Signaling Practice.
Committee IV—Direct Current Automatic Block Signaling.
Unfinished Business.
New Business.
Election Announcements.
Adjournment.

* * *

The members of the Excutive Committee of the American Wood-Preservers' Association will meet in Room 2 on the third floor of the Palmer House at 10 a. m. Wednesday morning. Following the conclusion of the day's meeting the members will attend the dinner in a group.

A number of A. R. E. A. committees have arranged to hold meetings in the Palmer House during the convention, among which are the following:

Tuesday—Committee on Uniform Contract Forms, breakfast meeting, Room 6, 8 a. m.
Tuesday—Committee on Rules and Organization, Room 6, 12:30 p. m.
Wednesday—Committee on Track, Room 5, 10 a. m.
Wednesday—Committee on Rail Stresses, Room 4, 10 a. m.
Wednesday—Committee on Water Service, Room 7, 12:30 p. m. Luncheon meeting with representatives of North Western Railways of India and Japanese Government Railways.
Wednesday—General Committee Division IV, A. R. A., Room 6, 12:30 p. m.
Wednesday—Electrical Section, A. R. A., Room 6, 2 p. m.
Thursday—Board of Direction, A. R. E. A., Room 3, 4:30 p. m.
Thursday—Conference of chairmen of all committees with Committees on Outline of Work and Personnel, Room 10

The A. R. E. A. Program

TODAY

President's Address.
Reports of Secretary and Treasurer.
Reports of Special and Standing Committees:
Standardization.
Uniform General Contract Forms.
Water Service.
Ties.
Ballast.
Iron and Steel Structures.
Wooden Bridges and Trestles.
Shops and Locomotive Terminals.
Rules and Organization.

Evening Session—Moving Pictures

"The Baltimore and Ohio Railroad Fair of the Iron Horse."
"The Mississippi Valley Flood of 1927."

TOMORROW

Electricity.
Signals and Interlocking.
Yards and Terminals.
Economics of Railway Operation.
Economics of Railway Location.
Economics of Railway Labor.
Track.
Rail.
Annual dinner, 6:30 p. m.

THURSDAY, MARCH 8

Roadway.
Masonry.
Grade Crossings.
Stresses in Railroad Track.
Wood Preservation.
Records and Accounts.
Buildings.
Co-operative Relations with Universities.
New Business.
Installation of Officers.
Adjournment.

CONVENTIONALITIES

H. A. McKeown, chairman of the board of railway commissioners of Canada, was a distinguished and unexpected guest at the meeting yesterday. Chairman Tillett brought him along from Canada.

* * *

H. S. Balliet, secretary of the Signal Section, who has never before missed an official annual meeting of the section, will not be present this year, being detained in New York because of the serious illness of his wife.

* * *

The many friends of E. S. Taylor, signal engineer, Canadian Pacific, will be glad to know that he is now recovering rapidly from a severe attack of pneumonia, which has kept him in bed since the beginning of January.

* * *

A. H. Yocum, signal engineer, Reading, is another regular who is missing this year. Mr. Yocum, we regret to state, has been confined to his bed for some weeks.

* * *

Tell your friends to tune in on the A. R. E. A. annual dinner. Through an arrangement with station WJJD the program of the dinner tomorrow evening will be broadcasted by that station, whose wave length is 365.6 meters. The program will go on the air at 8:45 p. m. central standard time.

* * *

The "beloved Englishman" is being sadly missed this year. Frank P. Patenall, who died in January, was an outstanding figure in the Signal Section and in the signaling field. As the co-inventor with L. F. Loree of the upper quadrant semaphore and as the developer of the color-position-light signal, his work will live after him.

* * *

The annual sing-song at the Signal Section luncheon was, as usual, a success, although the silvery tones of A. R. White, signal engineer, Los Angeles & Salt Lake, were missed. Fred Bender, signal engineer, Central of New Jersey, took Mr. White's place very acceptably, while the New York Central and Atchison, Topeka & Santa Fe tables supplied the volume for the chorus.

* * *

Another regular attendant who was missing this year is Harry Lewis, signal engineer of the Lehigh Valley. This is the first convention in years where we have not seen him. He was taken suddenly ill last week. A rather serious operation was necessary, but we are glad to report that he is recovering rapidly, and should be ready to start in on another record for attendance at the next meeting.

* * *

All those of the Signal Section who want to go up in the air are to be afforded an opportunity to do so. The Standard Oil Company has placed at the service of the section some of their new eight-passenger planes and any members or their wives who care to take advantage of the offer will be accommodated with a ride over the city. The flying field is at Sixty-third street and Cicero avenue.

* * *

Approximately 15 members of the Executive committee and chairmen of standing committees of the Roadmasters and Maintenance of Way Association met at the Auditorium hotel last evening for dinner, following which they reviewed the work of the association and transacted the business of the association. The meeting was scheduled for this time to permit the members to spend the day examining the exhibits at the Coliseum.

* * *

An innovation is being introduced in the A. R. E. A. program this year when a session is scheduled for this evening. Beginning at 7:30 p. m. motion pictures will be presented by C. C. Cook, maintenance engineer, Baltimore & Ohio, showing the complete history of the "Fair of the Iron Horse," the centennial celebration of the B. & O. at Baltimore. C. R. Knowles, superintendent of water service, Illinois Central, will also show motion pictures of the 1927 flood on the Mississippi river. Through the co-operation of the Railway Engineering section of the Western Society of Engineers, Chicago, the members of the latter organization have been invited to participate in this program.

* * *

Possibly at this meeting the warring factions of signalmen on the Terminal Railroad Association of St. Louis and the New York Central can get together. The war started over the question of which was the largest interlocking plant in the country, the one at the St. Louis Union Station or the one at the Grand Central Terminal in New York. Both sides seem to have grounds for argument. The New York plant has more levers, since each of its operated functions is controlled by an individual lever. However, the St. Louis faction maintains that the size of an interlocking plant is determined by the number of operated functions, regardless of levers. The St. Louis plant has two machines with a total of 219 levers and 462 operated functions, there being one machine with 212 levers and 450 functions and another with 7 levers and 12 functions.

* * *

Meet the Wife!—C. H. Tillett, the Chairman of the Signal Section, and Mrs. Tillett, the Chairman's Chairman, enjoying Quebec Hospitality at Montreal Last Summer

The Signal Section in Convention at the Stevens Yesterday

Signal Section Annual Convention Opens at Stevens Hotel

Five committee reports and four papers on economics of signaling presented at first day's session of two-day meeting

THE annual meeting of the Signal Section of the American Railway Association opened in the North ball room at the Stevens hotel, at 10 o'clock yesterday morning. C. H. Tillett, signal engineer, Canadian National, Central region, and chairman of the Signal Section, presided. The opening session was characterized by an unusually large attendance, 565 members and guests, in addition to 97 ladies being present. A total of five reports from standing committees were presented yesterday. In addition the Committee of Direction and Secretary Balliet submitted their annual reports. A feature of the program was the presentation of several papers on the economic benefits of signaling.

Memorial Service

The regular program of the morning session was interrupted for the conduct of memorial services in honor of the 17 members who died during the last year. Fitting tributes were paid to them by a number of those present. The names and positions held by the 17 men who passed on during the past year are as follows:

W. C. Kidd, salesman, Ramapo Ajax Corporation.
P. Kircher, resident manager, Union Switch & Signal Co.
J. D. Keiley, division engineer, Chesapeake & Ohio.
T. Murdock, president and general manager, Baltimore, Chesapeake & Atlantic.
J. A. Lister, section signal supervisor, Northern aPcific.
J. J. Killingswort, supervisor signals, Canadian National.
W. M. Page, chief engineer, Copperweld Steel Co.
A. L. Gardner, signalman, Boston & Maine.
F. E. Norman, special sales manager, Hubbard & Co.
H. Valen, signal gang forman, Chicago & North Western.
E. Singer, signal foreman, Baltimore & Ohio.
J. E. Griffith, assistant supervisor telegraph and signals, Pennsylvania.
S. U. Rhymer, superintendent telegraph and signal engineer, Chicago & Alton.
F. P. Pattenall, signal engineer, Baltimore & Ohio.
V. K. Spicer, special representative, Union Switch & Signal Co.
D. R. Day, sales representative, Aldobilt Co.
J. L. Phillips, manager, The Okonite Co.

Address of Chairman Tillett

The Signal Section is among the more expensive junior members of the American Railway Association family, our annual budget amounting to about $24,000. However, in view of the amount of work accomplished and the benefit to the railways of this continent, I do not think that we need look upon ourselves as a profligate offspring, and I am sure I have received no intimation from the officers of the American Railway Association that we are so considered. As a matter of fact I think there is evidence that the standing of this section in railway circles is steadily improving. We realize that we can furnish the railways with additional tools by the use of which they can produce more, better, quicker, safer and cheaper transportation, and this fact is being recognized by others, largely because of the existence of this section. It is proper that we should exist as an organization only as long as we are of an economic benefit to the American railways. I include in the term "economic" those features of operation generally classified as safety measures because unsafe practices are *not* economical.

Perhaps, because we advocate the transfer of responsibility of train operation from a man to a machine, we appear to meet the approval of the men who operate the railways. There is a mutual good feeling between this section and the American Association of Railway Superintendents, a friendship which I hope will endure, because of the common aim of the two organizations, and it is with pleasure that I advise you that membership in the Superintendents' association is open to signal engineers.

With respect to the special activities in the signal field today, the development of the remote operation of switches and signals by the train dispatcher now holds the limelight and bids fair to open up a new era in the history of single-track operation, eliminating as it does the necessity of telegraph operators delivering information to enginemen.

By the aid of the quite recent development of the car retarder and hump yard switching apparatus, more intensive use of yard tracks can now be made with considerable economic benefit under certain conditions and the attention of signal engineers will be drawn more and more to railway yards as fertile fields for development.

Since this section placed itself on record as favoring the elimination of derails in main tracks, the adaptation of automatic signals to the protection of railway grade crossings has become more general with the result that train stops are now being eliminated at many crossings that would not justify the expense of manually-operated protection.

Charles H. Tillett
Chairman

For the first time in the history of the Signal Section, A. R. A., or its predecessor, the Railway Signal Association, a resident of Canada, Charles H. Tillett, holds the position of presiding officer. Mr. Tillett was born at Peru, Ind., in December, 1884. Following graduation from Purdue university in 1907, he entered railway service with the Pennsylvania. In April, 1908, he went to the Great Northern on the construction of interlockings and leaving this road in February, 1910, he was appointed signal inspector on the Chicago & Eastern Illinois. After three years he left the United States and accepted a position as signal inspector on the Grand Trunk and since that time has been a resident of Canada. In September, 1910, he was promoted to supervisor of signals of the Eastern lines of the Grand Trunk, and in August, 1918, was promoted to electrical engineer of the signal department. In 1919, Mr. Tillett was appointed signal engineer of the Grand Trunk and at the time of the consolidation of this road with various other roads into the Canadian National System, he was appointed to his present position as signal engineer of the Central region.

It is now five years since Order No. 13413 of the Interstate Commerce Commission on automatic train control was issued. Probably no other order affected the peace of mind of our membership as much as this document. Developments along this line are by no means complete, but it is remarkable that from such an embryonic conception as existed prior to the issuance of this order, a full fledged adult exists today, five years later. The satisfactory nature of this development is shown by the considerable number of roads that have not only completed the installations ordered by the commission, but have voluntarily extended their mileage of automatic train control. The cab signal can be considered as an off-shoot of the automatic train control development, and its use instead of the wayside signal is a possibility which will not remain in the background much longer.

Solving the Highway Crossing Problem

The highway-railway grade crossing situation on this continent has become an international problem. Automobiles from California are seen in the Maritime provinces of Canada. Florida, Louisiana and Texas cars are common in Canadian cities in the summer months. This is indicative of the need of uniformity in the manner of protection of crossings throughout the continent. A few years ago this section was asked to recommend a standard aspect which might be used for indicating to the highway user the approach of a train on the railway. From the great multitude at our disposal, this section has recommended two.

Our failing is that we can only recommend: There is a noticeable tendency on the part of some railways to diverge from the aspects recommended by this section, in order, perhaps, to appease some local taste, and until such time as some force more effective than recommendatory action is used, we will probably experience a more or less chaotic condition of aspects for highway-railway crossing protection that is neither just nor humane.

The need is apparent for the formation of an international body with power to enforce recommendations that are made solely for the purpose of greater safety. It is possible that this end might be achieved by a joint conference embracing the railways, as represented by the American Railway Association, the public as represented by the Interstate Commerce Commission of the

United States, and the Board of Railway Commissioners for Canada, and the highways as represented by an international body of highway engineers. Such a conference would be representative of the interests involved and would not be so large as to be unwieldy. Its recommendations could well be made with the subject of a treaty similar to the one made between the two countries for the protection of migratory bird life. The protection of our migratory citizens should be as important as the protection of our migratory birds, although the dangers of extinction are not quite the same in the two cases.

The situation internally is not so serious in Canada as it is in the United States because of the control maintained by the Board of Railway Commissioners for Canada. This control has caused the recommendations of the Signal Section to be adopted as a uniform aspect for this purpose within the Dominion, an achievement that would never have been obtained without the action of some such a body with power behind it sufficient to enforce its recommendations, and it is not likely that uniformity will be obtained in the United States until the action of every railway, municipal, and state official in this respect is made subservient to the will of a central governmental body, such as the Interstate Commerce Commission. The question of legal jurisdiction is, I presume, paramount, but it has been my observation that the Constitution of the United States is rather an elastic document, and it could, no doubt, be made to stretch over this contingency.

Co-operation with I. C. C.

Having had long experience in a country where close co-operation has existed between the railways and the public, as represented by a regulating commission, I believe a great deal of benefit is going to accrue to the American public and the American railways through the elimination of certain misunderstandings that once appeared to exist between the railways of the United States and the Interstate Commerce Commission. From my observation, as an outsider, I think I can see a spirit of co-operation arising from the common endeavor of the railways and the commission to work out the automatic train control problem.

Public opinion will, I believe, in the not far distant future, be a more important factor in the highway-railway grade crossing situation. I suppose it is inevitable that differences of opinion will exist, and it is proper that these opinions should be stated freely. Often, however, careful analysis of what appear to be divergent views will disclose the existence of a basis through which, by co-operation, a common understanding may be reached. The indications are that this stage has about been reached in the train control situation, and it appears likely that this section will, in the near future, be called upon to standardize train control appliances. In this event, the section will no doubt in the future, as in the past, do all in its power to further friendly relations with all bodies whose aims are to promote the welfare of railway transportation, particularly the national and state commissions.

Following his address, Mr. Tillett introduced the Honorable H. A. McKeown, K. C., chief commissioner of the Board of Railway Commissioners for Canada. An abstract of Mr. McKeown's address follows:

Address of H. A. McKeown

By the increasing facilities, the increasing activities of this great country and of the country to the north, the responsibilities which are thrown upon regulating organizations are such as to make one desire to seek information from every possible quarter, and from no quarter can it be sought in a more authoritative and concise manner than from the organization of which your assembly here today is a part.

If there is any one thing which is essential to the existence of an organization such as the one to which I have the pleasure of belonging, it is the confidence of the people with whom it comes in contact.

I am pleased to say that during the years in which the Board of Railway Commissioners for Canada has functioned, it has not failed to gather up a reasonable measure of public confidence and of public respect. The railways and the technical officers of the commission work together, and they are the ones to whom the commission looks for guidance on disputed subjects. The members themselves come to the work without a technical knowledge of the subjects involved, and it is necessary for them to look to the technical officers and advisers who are permanent employees in the commission for guidance in highly complex and highly technical questions, when differences occur, with the desire that disputes can be allayed in a manner satisfactory to both parties.

Your chairman asked me to say something on the question of highway-railway grade crossings. We have in Canada, as here, the same problem, we have the same sinking of the heart when we read that a whole family has been hurled into eternity by a collision of an automobile and a train. Of about 500 people killed or injured in Canada last year, 80 per cent of the deaths were due to collisions of automobiles with trains. You cannot insure a man against his own folly and too often these unfortunate things occur through recklessness on the part of those who are driving automobiles. Yet when this is freely admitted we are not nearer a solution of the problem. I am not suggesting that in all or perhaps in any material number of accidents absolute carelessness should be put down on the part of the driver as the proximate cause of the disaster, but, according to reports of our engineers who investigate every accident, an exercise of ordinary care would make it impossible for such a fatality to take place. It is the measure of our obligation to assemble our equipment and devices so that he who uses the highway, even in this thoughtless manner, may have his attention so clearly brought to the jeopardy of his position that he will shrink from it.

We have in Canada about 30,000 highway crossings at grade. Perhaps not much more than 10 per cent of these crossing are protected, the accidents average only some 400 or 500 a year. Observation and inquiry convince me that these accidents would be much greater in number were it not for the extreme care which is exercised by the railways in the daily running of their trains.

As a member of our own board, I cannot give too much credit to the railways of our country for the alertness which they bring to bear upon this menace confronting them from day to day. I know of instances in which I am convinced that an accident resulting fatally has brought to the engineman in charge, an undying regret and a burden of sorrow almost if not equal to that borne by those who are

immediately connected with individuals who have lost their lives. Our trains are run by conscientious, careful men. Nothing is left undone on the part of those who are responsible for the conduct of our trains, either immediately with their hands upon the throttle or those who may give instructions to them, and the solution of the problem must lie in another direction.

Our board looks to its technical advisers to give reasons for the adoption or the substitution of any particular device or equipment.

The outstanding feature of our railway grade crossing protection is an appropriation made every year by the Parliament of the Dominion of Canada. Commencing the year 1909 they have appropriated every year the sum of $200,000, putting it to the credit or the order of the board for the purpose of partially defraying expenses in connection with dangerous crossings of highways and railways. That shows a common sentiment that this business must be attended to, that money must be spent in order that there may be safe crossings, and that the danger of taking life may be lessened.

A part of the expense of these crossings, whether that expense be simply putting up a warning signal or an overhead bridge, is met by a 40 per cent credit which can be paid out of the railway grade crossing fund (up to $25,000) that is placed against the expenditure. The remaining amount is divided between the railways and the municipalities, according to the judgment of the Railway Commission.

For instance, we have a railway grade crossing which we think should be eliminated. The parties in interest, as a rule, get in touch with the railway. In nine cases out of ten the people of that community find the railways responsive, and it is only in scattered instances that an issue develops which is left to the board.

The actual **construction of a highway** bridge, as well as of safety devices such as bells, wigwags, etc., is in the hands of the railway, because a railway can do the work with the equipment and the technical knowledge.

I believe that everything that can be done should be done to insure co-operation in method so that a man, whether he be in Florida or in the extreme Maritime Provinces of Canada, will meet with the same warning signal at a highway crossing, thus holding up to him the idea of safety. To effect the consummation of that result I feel sure that the Railway Board of the Dominion of Canada will co-operate in carrying out that laudable idea which you have in mind.

Report of the Committee of Direction

The Committee of Direction desires to call your attention to certain matters upon which it has acted during the period of March 8, 1927, to March 5, 1928: (1) Total number of memberships approved, 150; (2) The 1928 Annual Meeting was authorized to be held at the Stevens Hotel, Chicago, Ill., on March 5 and 6; (3) The subject-matter approved for letter ballot action at the 1927 Annual Meeting was ordered submitted to the Board of Directors of the American Railway Association for official approval. This action was taken and official approval received July 1, 1927; (4) The 1928 additions and revisions to the Signal Section Manual, complete to December 31, 1927, containing the subject-matter officially approved by the Board of Directors of the American Railway Association were ready for distribution to Manual holders on September 30, 1927, at $2.75 per set; (5) The 1926 Year Book, Volume XXIV, was ready for distribution on August 1, 1927, at $4.00 per volume to members and $6.00 to non-members; (6) The appointment of A. B. Himes (B. & O.) as Signal Section representative on the National Committee on Metals Utilization and the Division of Simplified Practice, which is considering the question of the simplification of flashlight cases, was approved; (7) The appointment of A. H. McKeen (U. P.) as Signal Section representative on a committee which is sponsored by the American Society of Mechanical Engineers for the purpose of further standardization of the principles and practices of graphic presentation, was approved; (8) The printing of 10,000 copies each of Chapters V—Batteries, and X—Alternating Current Relays, of American Railway Signaling Principles and Practices, was approved. To date three chapters have been printed and placed on sale. The total issue will comprise 26 chapters, each covering a different phase of signaling; (9) The appointment of E. K. Post (Penna.) in place of J. E. Saunders (D. L. & W.) as the alternate to represent the American Railway Association, Engineering Division, on the American Engineering Standards Committee, was approved.

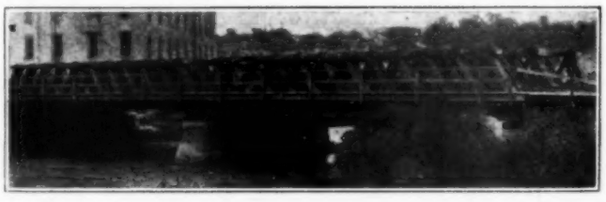
Annual Report of the Secretary

A net increase of 79 in the membership of the Signal Section was indicated in the report of H. S. Balliet, secretary. There were 317 new members added to the rolls and 238 members dropped. Of the latter 198 were removed on account of non-payment of their 1926 dues, while 23 members resigned and 17 were removed because of death.

Membership as of March 7, 1927		2,322
Additions during fiscal year 1927	317	
Losses by death during the year	17	
Resignations	23	
Dropped from roll	198	
	238	
Net gain in membership		79
Total membership today		2,401

There were 104 committee meetings held, 39 of which were in New York; 35 in Chicago; 10 in Pittsburgh, Pa.; 6 in Montreal, Que.; 4 in Cleveland, Ohio; 3 in Buffalo, N. Y.; 2 in Raleigh, N. C.; 2 in Atlanta, Ga., and the balance of three in the following cities: Fostoria, Ohio; Hoboken, N. J., and Omaha, Neb. The total attendance at all committee meetings was 628, and the total number of copies of minutes covering the meeting was 1,473.

During the period covered by this report there were 28 publications issued, containing a total of 2,342 actual pages of printed matter; the total number of copies printed was 67,685; the total number of sheets (standard size 6x9 in.), 9,706,660.



When the Pony Truss Was New

Report on Highway Crossing Protection

A. H. Rudd (Penna.)
Chairman
W. E. Boland (S.P.)
W. J. Eck (Sou.)
C. R. Hodgdon (C.P.)
C. J. Kelloway (A.C.L.)
H. W. Lewis (L.V.)
A. H. McKeen (U.P.)
H. G. Morgan (I.C.)
C. H. Morrison (N.Y.N.H.& H.)

A. H. Rudd

T. S. Stevens (A.T.& S.F.)
Vice-Chairman
H. H. Orr (C.& E.I.)
J. A. Peabody (C.& N.W.)
J. E. Saunders (D.L.& W.)
W. Y. Scott (B.& M.)
C. F. Stoltz (C.C.C.& St.L.)
C. H. Tillett (C.N.)
E. P. Weatherby (T.& P.)

THIS COMMITTEE submitted as information a report on a code of colors for traffic signals in co-operation with the American Engineering Standards Committee. A. H. Rudd (Penna.) represented the Signal Section, while W. J. Eck (Sou.) served as an alternate.

Code on Colors for Traffic Signals

On May 23, 1922, a conference was held in New York attended by representatives of about forty associations, consisting of automobile manufacturers, safety councils, traffic officers, automobile regulating authorities, public service commissions, and the Interstate Commerce Commission. At this conference it was voted that it was advisable to standardize in the United States the signals governing highway traffic.

The outgrowth of this meeting was a decision to refer the matter to the American Engineering Standards Committee. Various sub-committees were appointed; their reports codified and reviewed in 1924 by the Executive Committee of nine, representing the American Association of State Highway Officials, the U. S. Bureau of Standards, insurance companies, Eno Foundation, steam and electric railroads, National Automobile Underwriters Conference, Motor Truck Association of America, Motor Vehicles Conference Committee, and the manufacturers. A preliminary draft of the code was submitted by it to the Sectional Committee for consideration. After a tremendous amount of work, the code was agreed to by the Sectional Committee, submitted through its sponsors, namely, The American Association of State Highway Officials, the United States Bureau of Standards, and the National Safety Council, to the main committee for approval, and on November 15, 1927, was approved by the American Engineering Standards Committee as an American standard, five and one-half years after the first meeting.

The code as originally proposed included non-luminous as well as luminous signs, but, during the progress of the work, it developed that one of the sponsors, namely, the American Association of State Highway Officials, had almost completed its work of standardizing these non-luminous signs, and, as has been previously reported, there was a conflict of opinion between the Committee on the Code of Colors for Traffic Signals and this Association in the matter of the stop sign. In order to prevent overlapping, the code was, therefore, amended to cover colors for luminous signs only, thereby supplementing the standards adopted by the American Association of State Highway Officials instead of conflicting therewith. The code adopted as an American Standard follows:

Code on Colors and Forms for Traffic Signals for Highway Vehicles

Section 1. Purpose and Scope

Rule 10. Purpose—The purpose of this code is to provide a standard of colors and methods, as applied to highway traffic and vehicles, which will promote uniform usage and thus decrease the likelihood of accidents, and conserve human life and limb. The approval of specific signs or glasses, as complying with the specifications herein contained should be based upon tests made by competent and disinterested organizations having proper facilities and recognized standing, with final appeal to the United States Bureau of Standards.

Note: To secure the uniform application of this code, enforcing officers are urged to consult the committee which formulated it (or the American Engineering Standards Committee, 29 West Thirty-ninth street, New York) regarding matters of interpretation or items of dispute.

Rule 11. Scope—This code is intended to cover the use of luminous* signs and signals in connection with highway traffic, including moving and flashing signals; the use of lights, semaphores, and other signaling devices on vehicles.

Section 2. Vehicle Lights and Signals

Rule 20. Headlights—(a) Headlights shall be white, amber, yellow, or any intermediate hue. If electric headlights are used, they shall conform to the rules governing the approval of electric headlighting devices for motor vehicles, of the Illuminating Engineering Society (tentative standard of the A. E. S. C. D[2]);

(b) No red or green lights shall be displayed upon any vehicle so as to be visible from a point directly in front of it.

Rule 21. Tail Lights—Tail lights shall be red, as seen from the rear. (Note: Red has been adopted on account of its present universal use for this purpose. This use is not considered consistent with the general standardization of colors, and if a change is made in any jurisdiction, yellow is recommended.)

Rule 22. Warning signal lights—(a) Light signals displayed on a vehicle to indicate the driver's intention to reduce speed or change direction should be yellow. They shall not be red or green; (b) Non-luminous mechanical signals displayed to indicate the driver's intention to reduce speed or change direction shall consist of a semaphore which can be projected from the left side of the vehicle. It is recommended that the position of the semaphore when projected be limited to the horizontal.

Rule 23. Marker Lights—Marker lights to indicate the dimension limits of bodies or loads should be located as near the

*It is intended to cover standards for non-luminous signs in a future addition to this report.

upper left front corner as possible and should be yellow and visible from the front and rear.

Section 3. Highway Traffic Signals

Rule 30. Significance of colors—(a) Red shall be used as an indication to stop and for other purposes where required by law. (Note: The use of red is proper as an indication to stop and to then proceed if conditions are favorable, as, for example, when "stop and proceed" requlations are in effect.)

(b) Yellow shall be used as an indication to exercise caution. (Note: Yellow is appropriate when caution is to be exercised without stopping, as for partial street obstruction, so as to reserve red for a stop signal.)

(c) Green shall be used as an indication to proceed.

Rule 31. Significance of form—Where definite forms of luminous signs or signals are used either alone or in combination with colors to give the indication specified in Rule 30, the following will apply:

(a) Stop shall be indicated by having the greatest dimension horizontal, as with a horizontal string of lights. (Note: Where the word *STOP* is used to direct traffic, it should be in red letters arranged horizontally.)

(b) Caution shall be indicated by having the greatest dimension at an angle of 45 deg. with the horizontal when an inclined string of lights is used.

(c) Proceed shall be indicated by having the greatest dimension vertical, as with a vertical string of lights. (Note: Where the word *GO* is used to direct traffic, it should be in green letters arranged vertically.)

Rule 32. Significance of flashing—Flashing luminous signals shall conform to the use of colors prescribed in Rule 30.

Section 4. Signals at Railroad Grade Crossings

Rule 40. Aspect—An electrically or mechanically-operated signal used for the protection of highway traffic at railroad crossings shall present toward the highway when indicating the approach of a train the appearance of a horizontal swinging red light and/or disc. (Note: This covers the use of so-called wig-wags and of alternately flashing red lights, and the use of these devices should be restricted to the purpose of indicating the approach of a train.)

Rule 41. Location—The railroad standard highway crossing sign and the signal shall be mounted on the same post.

Rule 42. Operating time—Automatic signal devices for indicating the approach of trains shall be so arranged as to indicate for not less than 20 sec. before the arrival at the crossing of the fastest train operated on the track. Local conditions such as three or more tracks, bad approaches, etc., should be allowed for by increasing the operating time, bearing in mind that too long an operation by slow trains is undesirable.

Rule 43. Flashing light type—(a) *Height.* The lamps should preferably be not less than 6 ft. nor more than 9 ft. above the surface of the highway. (b) *Width.* The two lamps shall be mounted horizontally on 2 ft. 6 in. centers. (c) *Flashes.* Lights shall flash alternately. The number of flashes of each light per minute shall be 30 minimum, 45 maximum. (d) *Hoods.* Lamp units shall be properly hooded. (e) *Range.* When lamps are operated at normal voltage, the range, on tangent, shall be at least 300 ft. on a clear day, with a bright sun at or near the zenith. (f) *Spread.* The beam spread shall be not less than 3 deg. each side of the axial beam under normal conditions. This beam spread is interpreted to refer to the point at the angle mentioned where the intensity of the beam is 50 per cent of the axial beam under normal conditions. (g) *Lenses or roundels.* The size shall be 5⅜ in. minimum, 8⅜ in. maximum.

Rule 44. Wig-Wag type—(a) Length of stroke is the length of chord which subtends the arc, determined by the center of the disc in its extreme positions, and shall be 2 ft. 6 in. (b) Disc. The disc shall be 20 in. in diameter. A red lens or roundel should be placed at the center in front of the lamp. (c) Number of cycles. Movement from one extreme to the other and back constitutes a cycle. The number of cycles per minute shall be 30 minimum and 45 maximum. (d) The lamp, with which the disc shall be equipped, shall be lighted when the disc is swinging.

Rule 45. Approach signal—Advance warning signals which indicate approach to a railroad crossing, and not the actual approach of a train, shall conform to the provisions of Section 3, Rule 30.

Section 5. Specifications for Colors

Rule 50. Definition of Colors—Red, yellow and green as used in this code are intended to mean:

(a) The colors resulting from transmission of the proper light through the proper glasses and having the characteristics described in Rules 51 and 52.

Rule 51. Qualitative definition of colors for luminous signals—(a) *Red.* The spectrum of red shall contain both red and orange but not more than a trace of yellow and no green, blue, or violet. The most desirable hue is entirely free from yellow which means that the glass does not transmit the yellow light from a sodium flame. (b) *Yellow.* The spectrum of yellow shall contain red, yellow and green, with but little blue and no violet. The most desirable hue is entirely free from blue and might be designated a light amber. (c) *Green.* The spectrum of green shall contain yellow, green, blue and violet, with only a trace of red and orange. This hue is known as "admiralty green" and has a bluish tint when observed by daylight.

Rule 52. Quantitative definition of colors for luminous signals—The colors red, yellow and green shall have the following characteristics:

	Dominant wave-length	Purity	Integrel transmission of glass
	Millimicrons	Per cent	Per cent
Red	Not less than 624	Not less than 100	Not less than 10
Yellow	Not less than 592 nor more than 600	Not less than 97	Not less than 24
Green	Not less than 496 nor more than 536	Not less than 45	Not less than 11

These values are determined by the transmission of light from a source at the color temperature of 2,360 deg. K (practically that of the acetylene flame or present type of vacuum tungsten lamp at normal voltage) through the respective glasses. They are based upon spectral transmission measurements and upon computations carried out in accordance with the methods and data described in the Colorimetry Report of the Optical Society of America.

Note—The light and dark limits of the glasses on which the above values are based have the following relative transmissions on the scale of the American Railway Association:

	Light limit	Dark limit
Red	300	150
Yellow	200	100
Green	250	100

It will be noted that Rules 40 to 44 inclusive, under Section 4, Signals at Railroad Grade Crossings, are the specifications of the A. R. A., while Rule 45, covering the approach signal, conforms to the provisions of Section 3, Rule 30, which provides that red shall be used as the indication to stop, yellow for caution, and green for proceed, so that such advance warning signals would be yellow.

Discussion

[The report was presented by A. H. Rudd, chairman of the Committee]

A. H. Rudd (Penna.): In view of the presence of Mr. McKeown, I should like to say a few words before we proceed with the report. Next to uniformity two things are necessary,—(1) the education of the public as to what the uniform signals mean—the passing of some laws which will protect the would-be suicide against himself—and (2) the enforcement of those laws.

We take the position that in certain crossings with light traffic, the railroad has done its duty when it indicates that there is a railroad there. The United States Supreme Court recently has adopted our view.

In the matter of grade crossing protection, we hope some day our government will be as liberal as the Dominion's. In New York a bill has been passed, providing for a large fund—$400,000,000—the state borrowing the money and loaning part of it to the railroads. The railroads pay 50 per cent of the cost of grade crossing abolition, then amortize the loan and pay the interest.

In the state of New Jersey the railroads pay it all. A bill is pending now providing for adequate protection on the basis that the railroads have not made the crossings more dangerous but that the increased number of automobiles has. In the state of Pennsylvania we have arrived at an agreement with the Highway department, and approved by the Public Service Commission, that when we protect crossings on state highways the highway department pays half and the railroad half.

[Mr. Rudd then read the report of the Special Committee on Highway Crossing Protection].

Mr. Rudd: Since this report was written, I was a member of a committee of railroad men appointed by Mr. Hoover to prepare a standard ordinance for cities and towns which will contain traffic rules, laws, signals and signs, so that we may standardize throughout the United States. I was a member of the Committee on Signs and Signals. I found early in the game that the American Engineering Council, as an adviser of that committee, was at variance with some of our ideas.

Shortly after, Mr. Aishton wrote me asking me if I would serve on the American Engineering Council, because that body did not have any railroad representatives. They have recommended for adoption at the National Conference on Highway Crossing Protection either the wig-wag or the alternately flashing red light as an indication of the approach of a train. That is how far we have gone in standardization. Our recommendations have been adopted by the American Railway Engineering Association, and by the Code on Colors of Traffic Signals, thus making it an American standard and carrying with it the approval of the National Association of Highway Officials and the American Engineering Council. Undoubtedly it will be adopted by the Third National Conference on Highway Crossing Protection.

The committee submits this for letter ballot approval for inclusion in the Manual. (Mr. Rudd's motion *that the limits set forth in the report be accepted for submission to letter ballot for inclusion in the Manual was then put and carried.)*

W. P. Borland (I. C. C.): Has the committee given any consideration to any other form of protection to augment or supplement the standard which has been adopted, such as gates or something of that kind?

Mr. Rudd: Yes sir, we have. The question that was referred to us was the automatic protection of the crossing. That is what we have handled.

Mr. Borland: We are interested in that particular because it is before us now in several forms.

Mr. Rudd: In the opinion of the committee, not expressed officially, but for the information of the representatives from the Interstate Commerce Commission, gates are a good thing to protect a train against a foot passenger if he does not get under it and a good thing for horse-drawn vehicles, but it is just an annoyance to an automobile. The automobile comes up to the gate and just brushes it aside. There are more gates broken every year than there are watchmen killed. We are taking out gates wherever we can, wherever the public authorities permit us, and putting in the automatic protection. We are taking off watchmen where we can and putting in automatic protection, because we think it is more reliable.

Mr. Borland: I agree with that attitude. The question is whether or not it might be possible to develop a gate that would be right.

Mr. Rudd: The broader question of gates and all protection will be brought up at the A. R. E. A. meeting when the Committee on Highway Crossings makes its report.

Report of Committee on Standard Designs

A. H. McKeen (U.P.)
Chairman
F. H. Bagley (S.A.L.)
P. M. Gault (M.P.)
C. J. Kelloway (A.C.L.)
J. C. Mock (M.C.)
C. H. Morrison (N.Y.N.H.& H.)

A. H. McKeen

G. K. Thomas (A.T.& S.F.)
C. A. Christofferson (N.P.)
E. K. Post (Penna.)
W. M. Punter (C.N.)
H. L. Stanton (Penna.)
L. Wyant (C.R.I.& P.)

THIS COMMITTEE submitted five revised drawings, recommended that six drawings be made obsolete and submitted four new drawings. Those suggested as needing revision included: (a) A. R. A. Sig. Sec. 1070B—covering a change in screw thread standard for A. R. A. binding posts and nuts, from 10-30 to 10-32 thread; (b) A. R. A. Sig. Sec. 1084B—covering a revision to make the assembly drawing show the use of the improved type of top roller pin for mechanical plant pipe carriers; (c) A. R. A. Sig. Sec. 1085B—covering a similar change in drawing of pipe carrier details to incorporate the improved type of top roller pin for pipe carriers used to mount mechanical interlocking pipe lines; (d) A. R. A. Sig. Sec. 1504B—regarding the change of the size of the pin hole from ½ in. to 33/64 in. in the lever number plate for mechanical interlocking machines. The added clearance is recommended to prevent breakage of the pin when applying the number plate; (e) A. R. A. Sig. Sec. 1399B—Low Target Stand—Details and Assembly, revised to make it interchangeable, right or left-hand.

The drawings to be rendered obsolete include: R. S. A. 1001—Wire Adjusting Screw—Details and assembly, R. S. A. 1226—Stuffing Box for Wire, R. S. A. 1237—Adjustable Lock Rod—Details and assembly, R. S. A. 1350—Horizontal Chain Wheels.

R. S. A. 1351—Vertical Chain Wheels, and R. S. A. 1352—Vertical Chain Wheels.

Four new drawings, A. R. A. Sig. Sec. 1614A—Base for Ground Signal Masts (superseding Drawing 1034), A. R. A. Sig. Sec. 1615A—Foundation for Mechanical Dwarf Signals (superseding R. S. A. Drawing 1106), A. R. A. Sig. Sec. 1597A—Concrete Battery Box (superseding A. R. A. Sig. Sec. 1343), and A. R. A. Sig. Sec. 1598A—Concrete Battery Box—Details (superseding R. S. A. 1342), were submitted for acceptance for submission to letter ballot.

Electric Lamps for Signals

A total of 167 varieties of lamps are being used by signal departments for the lighting of signals and other signal and interlocking apparatus. Of these, 143 are termed special.

We have been advised that upwards of 215,000,000 lamps are produced annually for commercial purposes; of these there are 87 varieties, and only about 215,000 produced for signal lighting; of these there are 143 varieties; the price to consumers has a direct bearing upon quantity demand for each kind. For example, the list price of a lamp, as shown on A. R. A. Sig. Sec. 1544, having tolerance of plus or minus 3/64 in. on axial alignment and light center length, is 50 cents and a lamp with a tolerance of 1/32 in. is 75 cents each. The "Precision" lamps are selected from among the regular lamps.

Other advantages, even more important than first cost to the user, will be found in standardizing on fewer varieties, eliminating the confusion and errors in replacement of outages, in ordering, and in the reduction of stock.

Lamp characteristics necessary to meeting signaling requirements are: 1, long life; 2, low voltages; 3, precision of filament to secure accurate focus with lens or reflector; 4, good socket contact; 5, as low wattage as practicable; and 6, convenient size bulb.

1. Lamp Life. The life of all lamps is based on burning continuously at rated voltage. If burned intermittently, the added life is said to be so little that it may be neglected. Under voltage burning gives reduced candle power and longer life, but the entire theoretical life cannot be expected as service conditions and other factors affecting the life are not alike.

2. Low Voltage. As almost all signal apparatus is designed to operate with low-voltage current, the electric lamps ranging in voltage from 2½ to 16 meet present day requirements best.

3. Filament. While various shapes of filaments for low-voltage lamps are now in use, the C-21, C-3, and rounded C-2, and PS-16 are best for signaling; of these the C-3 shown on A. R. A. Sig. Sec. 1544 is the least efficient and the rounded C-2 the best. The C-2, when properly focused, gives more beam candle power than the C-21, due to the absence of dark spots caused by anchorage. It can be produced by automatic machinery. Single filament lamps are recommended by the manufacturers instead of a multiple filament (both burning), because the single filament is more rugged in consrtuction resulting in longer lamp life; they are also easier to make. The multiple filament is not insurance against failures, since failure of the one throws excess voltage on the other and it soon fails also, and the excess voltage of the remaining filaments makes it difficult to detect the failure of the one.

4. Bulb. The S-11 plain pulb for the voltage range above, appears to be best and is recommended by the manufacturers. It can be made quite uniformly as to size and shape; its extensive use on automobiles gives it good quantity production; it is convenient to handle in the factory, field and stock room. As tests indicate, the corrugations on the bulb reduce the beam candle power. The plain bulb is recommended. The S-14 bulb should be discontinued as it is expensive, obsolete and not suitable for precision, or proper exhaustion.

5. Base. The single-contact bayonet candelabra base is now standard, has been proved in service, and, of course, should be continued as standard for all signaling except for track diagram where the miniature screw socket is regarded as necessary.

6. Precision. Since the filament of a low-voltage lamp produces a small light area, it is important to have the light center in focus. Variations in the location of filaments with respect to the base pins or with the theoretical correct light center and axial alignment causes poor signal lights. It is essential that variations be as small as practicable, particularly in lamps with rounded C-2 filaments. The manufacturers' representatives advise that improved methods enable them to make "regular" lamps of this type to meet a tolerance of plus or minus 3/64 in., and that precision lamps will be furnished to meet a tolerance of plus or minus 2/64 in. in axial alignment and light center length.

The possibility of using the S-11 rounded C-2 filament lamp for day indications of light signals was discussed. The signal companies' representatives asked for 1/64 in. tolerance; they were told that such accuracy could not, at present, be assured, but that the tests would be made in the laboratory and in the field. Some field tests have been made near Nela Park on the New York Central but records of the results are not available for this report. It is therefore thought best to continue the use of the rebased P-16 lamp with the doublet lens pending further tests, and that the signal companies endeavor to provide interchangeability of the rebasing. At the present, it is in an unsatisfactory state for the railroads having light signals of more than one make and consequently a number of roads have abandoned rebased lamps, using instead the S-11 lamps and adapter.

Our conclusion from the foregoing is that the following schedule of electric lamps is best suited for signal and interlocking requirements, except position light signaling, for which it appears to be necessary to continue temporarily the PS-16 rebased lamp. While some signal engineers continue using the CT-8 lamp with Lebby mirrors, we believe the S-11-C-2 lamp will be found to be a satisfactory substitute.

Schedule No. 1 for Electric Lamps

No.	Bulb	Filament	Base	Volts	Amperes	Watts	Life (Hours)	Remarks
			For Night Signals					
1	S-11	C-2	S.C.B.C.	3.5	.3		1000	
2	S-11	C-2	S.C.B.C.	10.	.25	2.5	1000	
3	S-11	C-2	S.C.B.C.	13.5	.25	3.375	1000	
			For Daylight Signals					
4	S-11	C-2	S.C.B.C.	8	10 and 18		1000	
5	S-11	C-2	S.C.B.C.	10	10 and 18		1000	
			For Use With Lebby Lens					
6	CT-8	C-2	S.C.B.C.	8	5 and 10		1000	
7	CT-8	C-2	S.C.B.C.	10	5 and 10		1000	
			For Highway Flashing Signals					
8	S-11	C-2	S.C.B.C.	10	5 and 10		1000	
			For Track Diagrams					
9	G-6	C-2 Miniature Screw		12	.2		1000	
			For Interlocking Levers					
10	G-6	C-2	S. or D.B.C.	12	.2		1000	

Action recommended, acceptance as information.

Discussion

[Chairman A. H. McKeen (U. P.), presented revised drawings as listed in the report for acceptance for submission to letter ballot superseding the subject matter now in the manual. *His motion to this effect was carried.*]

Mr. McKeen: The committee also submits the drawings which represent obsolete practice, for submission to letter ballot for removal from the manual.

[*His motion to this effect was carried.*]

Mr. McKeen: The committee presented the new drawings which were submitted for acceptance for submission to letter ballot.

[*His motion for acceptance was carried,* J. C. Mock (M. C.) then presented a progress report on the subject of electric lamps for signals.]

C. H. Morrison (N. Y., N. H. & H.): I am wondering if the S-11 bulb is to be used. I notice in the table no higher wattage than the 10 to 18, while it is common practice on the New Haven to use 27, 40 and 50-watt bulbs. We believe that where electric energy is secured from the service line, the expense of electric current is so small compared with the amount of benefit which the electric light gives that we believe a higher wattage giving a more powerful light is more beneficial and will take care of the extra expense. I do not believe an S-11 bulb is of sufficient diameter to take care of 27, 40 or 50 watts. We use these in semaphore signals. I note that the report refers to daylight signals. We also use a 40-watt bulb in the daylight signal. Therefore a provision should be made for a bulb of a size that will be large enough for 40 watts.

Mr. Mock: I understand that S-11 is not recommended for anything above 32 volts and that the committee does not even want to use it for 32 volts.

Mr. Morrison: We use 8-volt, 40-watt lamps.

A. W. Fisher (U. S. & S.): The S-11 lamp is limited to 25-watts.

[H. H. Helmbright (G. E.), confirmed that information. When any requirement of wattage is greater than 18, the committee favors 25. Twenty-five watts would be the limit in the S-11 bulb. The larger bulbs that are needed to take care of that wattage would probably be the size of the PS-16, perhaps the G-18½ or the G-16½. The G-18 is generally used now and the P-16 is being used for daylight signals of 10 volts, 40 watts and of 10 volts, 30 watts.]

Mr. Morrison: I am of the opinion that those using 40-watt lamps would find it advisable to go to the standard Edison screw-base.

Mr. Fisher: I believe the paragraph you just read answers Mr. Morrison's question about providing screw-bases for 40-watt lamps. If you are using low-voltage lamps your filaments are small, and you want greater accuracy in location than is possible with a screw-base lamp. If you want to maintain an accurately located base and an accurately manufactured lamp, it should be of a bayonet type. If you go to a larger bulb than the S-11 with 40 watts, the G-18 lamp is the only one used in the candelabra base, it being so much larger in diameter than the base that the lamp is weakened. It can be twisted off the base much easier than the S-11.

Mr. Mock: The New York Central Lines have been making some tests, and have inspected all their lamps. The number of incandescent lamps inspected exceeded 1,000,000, and the rejections amounted to about two per cent. The inspection cost was approximately 12¼ cents per 100 lamps.

J. E. Saunders (D. L. & W.): How many of these are commercial lamps, that is, used in other lines of work?

Mr. Mock: These lamps are all in use now and are all standardized.

B. J. Schwendt (N. Y. C.): Some references have been made to tests on the New York Central. We were unable to get enough bulbs to put on an extended test, so confined it to a local test, comparing a signal equipped with the S-11 bulb with an adjacent signal equipped with the PS-16 bulb. The PS-16 bulb signal was adjusted to make sure it was the best signal that could be obtained from such a bulb. We took about 36 lamps selected at random all with S-11 bulbs and inserted one-half of them to compare them with the PS-16 bulb. The result was favorable to the S-11 bulb. The S-11 has one advantage, which is quite noticeable. The commercial tolerance of the S-11 bulb, 2/64 in., is twice as great as in the PS-16 bulb, but due to its shorter light center length it doesn't require such great tolerance.

C. A. Dunham (G. N.): The Great Northern has 1,400 miles of color-light signals, and we have standardized practically on two makes of lamps. One is an 8-volt, 5-watt, and the other an 8-volt, 10-watt lamp. Even a low wattage lamp, 5 watts, for instance, if used with accuracy of adjustment, is sufficient for the purpose.

Chairman McKeen: The desire of the committee is to boil down the 57 or more varieties to as small a number as possible in order that we can get away from the precision work and obtain a lamp that can be put on a production basis. It is doubtful whether in the 40-watt lamp, the S-11 type is necessary.

The committee also presents revised drawings on a low target stand. This drawing is submitted for acceptance for submission to letter ballot superseding subject matter in the manual.

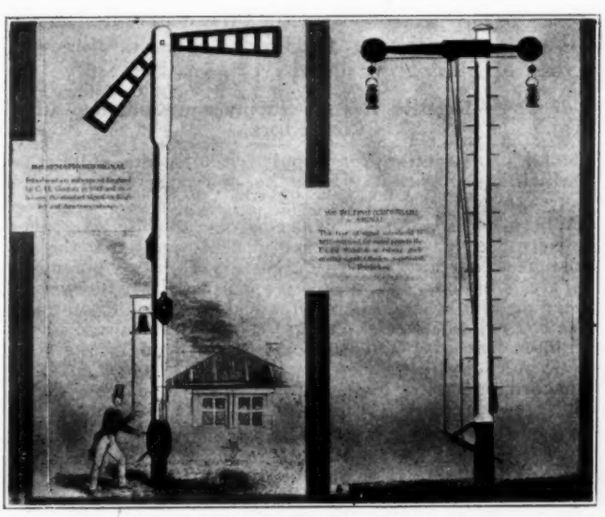
[*The chairman's motion to this effect was carried.*]

Chairman McKeen: The committee presents new drawings for a concrete battery box and concrete battery box details for acceptance for submission to letter ballot superseding subject matter in the manual.

R. B. Ellsworth (N. Y. C.): Referring to Plan 1597A, this plan, or a similar one, was objected to previously and referred back to the committee. I am disappointed to see it here again, with the recommendation that it supersede the present standard of the section, which is much superior to this plan from an economical point of view, in that it provides a lining to protect the batteries and particularly the primary batteries in cold temperature.

Chairman McKeen: The committee recommends that drawings 1597-A and 1598-A (concrete battery box and details) be submitted for acceptance for submission to letter ballot superseding subject matter in the manual.

[*His motion was put and carried.*]



Courtesy H. M. Sperry

Early Days in Railway Signaling

Report on Overhead and Underground Lines

G. H. DRYDEN (B.& O.)
Chairman
F. W. BENDER (C.R.N.J.)
G. W. CHAPPELL (N.Y.N.H.& H.)
G. R. COWHERD (S.P.)
L. D. DICKINSON (Penna.)
W. H. ELLIOTT (N.Y.C.)
J. A. JOHNSON (M-K-T)
J. B. LAMB (Sou.)
J. LEISENRING (I.T.)

G. H. Dryden

C. W. HIXSON (Penna.)
Vice-Chairman
H. W. LEWIS (L.V.)
A. H. RICE (D.& H.)
W. K. SAUNDERS (R.F.& P.)
W. Y. SCOTT (B.& M.)
E. G. STRADLING (C.I.& L.)
G. W. TROUT (P.M.)
W. B. WEATHERBEE (B.& A.)
E. WINANS (A.T.& S.F.)
J. P. ZAHNEN (C.R.I.& P.)

THE COMMITTEE submitted reports on: Revision of Manual; Cooperative Report; Revision of National Electrical Safety Code; and Cooperative Report, Bureau of Standards.

Revision of Manual

The committee recommended the withdrawal of A. R. A. Signal Division Specification 10920 from the manual and the adoption of the approved specification of the Electrical Section found in the publication of the A. R. E. A. under heading "Railroad Specifications for Electric Light, Power Supply and Trolley Lines Crossing Railways," adopted on March 15, 1923, this also being found in the T. & T. manual under the heading "S-1." Action recommended, acceptance for submission to letter ballot.

Cooperative Report, National Electrical Safety Code

The committee reported that the revised code has been approved and is now a National Standard. Action recommended, acceptance as information.

Cooperative Report, Bureau of Standards

The Signal Section is particularly interested in the following quotation from Hand Book No. 10 of the Bureau of Standards, dated April 15, 1927:

"Rule 22-B—Relative Levels—Supply and Communication Conductors

"Special Construction for supply circuits, the voltage of which does not exceed 550 volts, and carrying power not in excess of 1600 watts.

"Where all circuits are owned or operated by one party, or where cooperative consideration determines that the circumstances warrant, and the necessary coordinating methods are employed, supply wires carrying a voltage not exceeding 440 volts, where practicable, or in exceptional cases 550 volts between conductors, with transmitted power not in excess of 1,600 watts, when involved in the joint use of poles with communication circuits, may be installed in accordance with Note h-3 of Table 1 in Rule 232 A, and Note a of Table 11 in Rule 238 A, 1, under the following conditions:

"(a) That such supply circuits are of wire having a good grade of commercial double-braid weatherproof covering not smaller than No. 8 A. W. G. medium hard-drawn copper or its equivalent in strength, and the construction otherwise conforms with the requirements for supply circuits of the same class.

"(b) That the supply circuits be placed on the end and adjacent pins of the bottom cross-arm, and that a climbing space of at least 30 in. be maintained up the pole. Special precautions shall be taken to render such circuits conspicuous, such as painting a stripe on the cross-arm or using a different form of insulator from the others on the pole line.

"(c) That there shall be a vertical clearance of at least 2 ft. between the cross-arm carrying these supply circuits and the next cross-arm above. The other pins on the cross-arm carrying the supply circuit may be occupied by communication conductors used in the operation or control of railway or supply apparatus, but not for telegraph or telephone service.

"(d) That such supply circuits shall be equipped with fuses and arresters installed in the supply end of the circuit. The fuses shall have a capacity not in excess of twice the maximum operating current value of the circuit they protect, but need not be less than 7 amp. The arresters shall be designated so as to break down at a voltage of approximately twice the voltage between the wires of the circuit, but which need not be less than 500 volts.

"Where the supply circuits are alternating current, fuses shall be installed in the secondary side of the supply transformer and shall be such as to open the circuit successfully when the voltage is as great as that of the primary voltage of the transformer."

Action recommended, acceptance as information.

Discussion

[The report was presented by Chairman G. H. Dryden (B. & O.), who stated that the committee recommended the withdrawal of A. R. A. Sig. Div. Spec. 10920 from the Manual and the adoption of the approved specification of the Electrical Section, A. R. A., found in the publication of the A. R. E. A. under the heading, "Railroad Specifications for Electric Wire Crossings," and adopted March 15, 1923, this also being found in the T. & T. Manual under the heading "S-1."]

Mr. Dryden: I want to say that the section was too hasty a few years ago in the adoption of this specification. We adopted the recommended report of a subcommittee which later went to the Electrical Section but failed to be approved by them. Two or three years later the Electrical Section adopted the specification which we propose to use at the present time.

The committee recommends the withdrawal of Specification 10920 and the adoption of the specification of the Electrical Section bearing the same title, namely, "Electric Light, Power Supply and Trolley Lines Cross-

ing Steam and Electric Railways," for submission to letter ballot, and I *so move.*

[*The motion was carried.*]

Mr. Dryden: That part of the National Electrical Code specification in which this section is particularly interested was prepared principally for our benefit to enable us to place our wires on telegraph poles along with communication wires occupying the lower crossarm. The specification is copied exactly as prepared by the code and the recommendation is that it be accepted as information. Those contemplating the erection of power wires on telegraph poles, such as are used for charging storage batteries and for continuous train control, may follow this specification and not get into trouble. This information is therefore important and permits extensive economy.

Report on Economics of Signaling

J. E. Saunders (D.L.& W.)
Chairman
E. B. DeMeritt (C.of G.)
W. J. Eck (Sou.)
W. F. Follett (N.Y.N.H.& H.)
R. B. Jones (C.P.)
O. S. Major (K.C.S.)
G. S. Pflasterer (N.C.& S.L.)
F. W. Pfleging (U.P.)

J. E. Saunders

B. J. Schwendt (N.Y.C.)
Vice-Chairman
W. M. Post (Penna.)
R. T. Scholes (C.B.& Q.)
L. R. Stahl (L.& N.)
W. S. Storms (Erie)
C. A. Taylor (C.& O.)
O. R. Teague (S.A.L.)
L. S. Werthmuller (M.P.)

THE COMMITTEE presented as information a report on the effect of installing automatic signals, which was an abstract of information concerning the savings and benefits of automatic signals which has been published previously and which was abstracted from a report of the American Railway Engineering Association dated February, 1926.

The following papers, illustrated by lantern slides and motion pictures, all having to do with the economic advantages of recent developments in the signal field were presented as a part of the committee report.

"Economic and Other Advantages of Automatic Signaling on the Seaboard Air Line," by O. R. Teague, superintendent staff, Seaboard Air Line.

"Operation of Trains by Signals on the Ohio Central Lines of the New York Central," by B. J. Schwendt, assistant signal engineer, New York Central, West.

"Operation of Trains by Signal Indication on a Section of Single Track on the Central of Georgia," by E. B. DeMeritt, signal engineer, Central of Georgia.

"Saving in Operating Expenses by the use of Spring Switches in Main Tracks," by F. W. Pfleging, signal engineer, Union Pacific.

[Several slides and a film of motion pictures accompanied Mr. Pfleging's discussion of the data shown in the following tables.]

Spring Switch Installation—Railroad "A"

Time and money lost by trains on account of making stops for hand-thrown switch at end of double track, as compared with proceeding without stopping by running through spring switch.

Items	Through Passenger		Local Trains	Through Freight		Local Trains
(a) Number of Trains	30		92	98		18
Time lost per month						
(b) Average loss per train	4 min.		....	10 min.		....
(c) Total loss	2 hr.		....	16.3 hr.		....
(d) Average number of trains on overtime	....		....	28		....
(e) Overtime loss per train	....		....	10 min.		....
(f) Total overtime loss	....		....	4.6 hr.		....
Time and money lost per year						
(g) Total time loss	24 hr.		....	195.6 hr.		....
(h) Total overtime loss	....		....	56 hr.		....
(i) *Freight train delay (gx$24)	....		....	$4,694.40		....
(k) Freight train overtime (hx$5.4755)	....		....	306.63		....
(l) Passenger train stops (30 per month x12x$1)	$360		....	....		....
Total money loss	$360			$5,001.03		....

Total money loss per year to be saved by use of spring switch

Passenger trains	$ 360.00
Freight trains	5,001.03
Total	$5,361.03

*Cost per freight train-hour (delayed time) figured at $24.00. See page A-302, 1922 and Table 2, page 587, 1924 A.R.A. Proceedings. Cost per passenger train stop figured at $1.00 per stop. Actual figures on this cost not available and figure of $1.00 per stop, estimated.

Spring Switch Installation—Railroad "B"

Estimated cost and savings per month by installation of spring switch at end of yard lead switch. (Number of train movements over switch not available, therefore, savings, fuel, overtime and delayed train time not included.)

*Estimated cost of installation	$400.00
Estimated average maintenance cost per month	40.00

With the installation of spring switch and block signal controlled by the dispatcher it was possible to eliminate three operators at a saving of $4,500.00 per annum.

*Cost of installation estimated as installed in connection with signaling. At this particular location all signals would have been installed if the switch had been hand thrown.

SPRING SWITCH INSTALLATION—RAILROAD "C"

Time and money lost by trains on account of making stops for hand-thrown switch at end of double track, as compared with proceeding without stopping by running through spring switch.

Items	Passenger Trains	Freight Trains
(a) Number of trains	184	124
Time lost per month		
(b) Average loss per train	4 min.	10 min.
(c) Total loss	12.26 hr.	20.66 hr.
Time and money lost per year		
(d) Total time loss	147.53 hr.	248 hr.
(e) *Freight train delay		$5,952.00
(f) **Passenger train stops (184 per month x 12 x $1)	$2,208.00	
Total money loss	$2,208.00	$5,952.00

Total money loss per year to be saved by use of spring switch.

Passenger trains	$2,208.00
Freight trains	5,952.00
Total	$8,160.00
†First cost of spring switch (A&B)	$ 334.49 (See note)
(O.E.)	694.74
Total	$1,029.23

*Cost per freight train-hour (delayed time) figured at $24. See page A-302, 1922, and Table 2, Page 587, 1924 A.R.A. Proceedings.

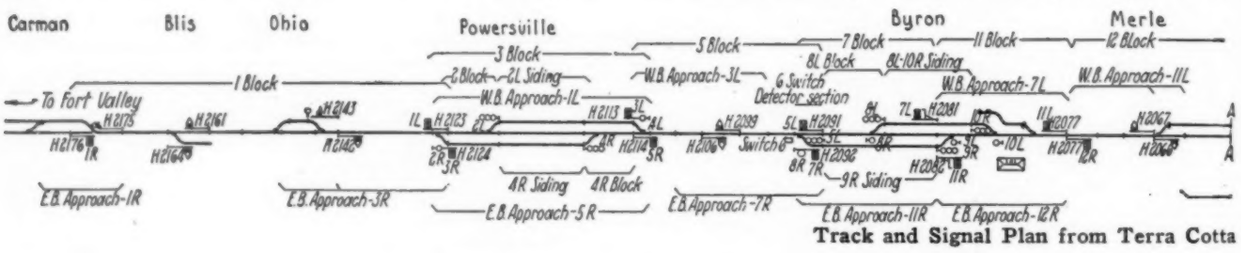
**Cost per passenger train stop figured at $1 per stop. Actual figures on this cost not available and figures of $1 per stop, estimated.

†First cost of spring switch as shown includes cost of 49.3 ft. additional track account replacing No. 10 turnout with No. 14 turnout.

Operating Trains by Signal Indication on Single Track*

By E. B. DeMeritt
Signal Engineer, Central of Georgia

THE OBJECT of this paper is to show the results obtained by a special signal arrangement to handle trains by signal indication without train orders on the Central of Georgia between Macon, Ga., and Fort Valley, which is the neck of the bottle of several lines. Of this 29 miles approximately 3 miles on the Macon end and 2 miles on the Fort Valley end are double track with the intervening 24 miles from Terra Cotta to Carman, single track.



Track and Signal Plan from Terra Cotta

Heavy Traffic During Peach Season

Fort Valley is the center of the Georgia peach belt and from this point refrigerator cars with initial icing are distributed and after loading, the cars are re-iced here. The peach season starts in the latter part of May or the first of June and lasts for six weeks or two months, with the peak sometime in July.

In addition to handling the through movement of peach trains which are assembled in Fort Valley the single-track line between Carman and Terra Cotta also has to carry switching movements in placing cars and picking up loads at the various spurs during the time of the heaviest traffic.

Manual block was used between Macon and Fort Valley for several years before the installation of automatic signals in 1917. The automatic A. P. B. signals were put in, not only for safety of operation, but also to expedite train movements. A few years later the use of the "19" order was extended to supplant the use of the "31" order in all automatic signal territory.

One phase of the method of operation on the Central of Georgia must be understood to see clearly the development that has taken place in the signaling and operation in this particular location, and that is that in manual block territory we do away with the superiority of trains. Rule 305 reads:

"Block signals govern the use of blocks, but, unless otherwise provided, do not supersede the superiority of trains; nor dispense with the use or the observance of other signals whenever and wherever they may be required."

Manual block dispenses with the superiority of trains and eliminates practically all train orders. The capacity of single track under this method, with operators at each passing track, is greater than where train orders are used without automatic signals but with a ten min. spacing rule. How much the capacity of track is increased by the use of train orders with automatic signals depends largely on the number of operators and the ability of the dispatchers. For a number of years we have not used manual block on the lines where passenger trains are operated, except in automatic signal territory.

The combination of manual block, doing away with the superiority of trains; with automatic signals, doing away with the 10-min. spacing rule and allowing following moves on the 45 deg. indication of the automatic signal with a card from the operator, is a safe and effective way of handling heavy traffic on single track.

This combination of manual and automatic block without superiority of trains and so with practically no train orders, was used frequently between Macon and Fort Valley during the few weeks of heaviest traffic in 1920 to 1925. Under this method of operation it is a simple matter to advance a freight train against a late passenger or scheduled freight, as no written orders are necessary. However, through movements are slowed up, as the engineman of an approaching train must see the manual block signal change from "Stop" to "Proceed" and therefore every train must approach

*For other information on this installation see *Railway Age* for June 18, 1927, page 1935, and *Railway Signaling* for July, 1927.

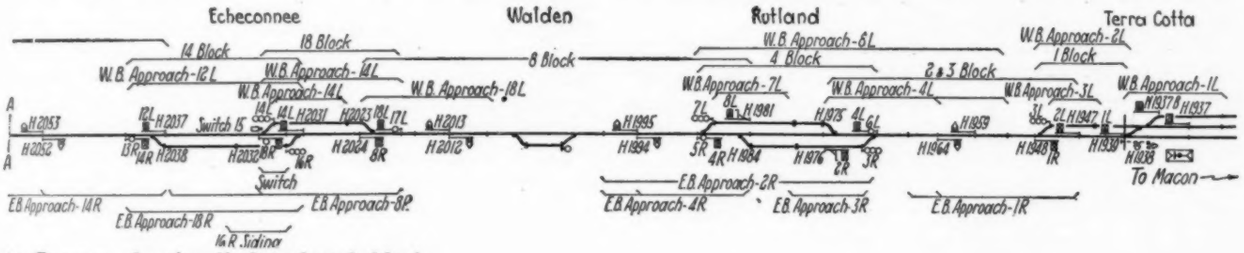
every manual block signal prepared to stop or head in at the entering switch of the proper passing track.

A New Method of Signaling

In 1924, a special signal arrangement was installed between Macon and Paynes, on the line to Atlanta, which enabled trains to operate on signal indication. This signaling gave such satisfactory results that it was decided to install a similar arrangement on the single track between Carman and Terra Cotta. * * *

From an operating point of view this new scheme must add to the advantage of manual block and overcome the disadvantages. For through moves, an engineman must be given clear signals at all locations, so that maximum speed can be made. When a train is to enter a passing track, information must be given the engineman of the train to approach the entering switch prepared to stop and at the switch, specific instructions must be given to head-in. With a train in the passing track a means must be provided for indicating when the train should head-out and proceed.

The signaling had to speed up traffic on a division where overtime of freight train crews was already low, as freight trains averaged better than 13 m. p. h. There were only three continuously open telegraph offices and two of these were necessary for other purposes than train orders for this territory, therefore there was no large reduction of operators' pay roll to be made. Further, the installation had to show a return on the investment at times of the year when traffic would not exceed 30 trains a day and yet be flexible enough to handle efficiently, twice that number of trains. * * *



to Carman, showing limits of each block

Control Concentrated at Two Points

On account of freight trains entering and leaving the main line at Terra Cotta, it was decided to retain operators at that point and they were given control over the signals and therefore over the train movements for approximately one-third the territory. Another set of operators were retained at Byron to control the balance of the territory. Control of the signals was given the operators by means of interlocked desk circuit controllers and information as to the location of trains conveyed to them by means of the indicators on these controllers.

The operator at Terra Cotta controls movements between that point and the east switch at Echeconnee. The operator at Byron controls movements between the east switch at Echeconnee and the end of double track at Carman.

Power switch machines are used at only two points where there are heavy grades either entering or leaving the passing track. Where power switch machines are not used the indication to take siding is given by a red light signal unit with a black letter "S" on the cover glass, located at the entering end of the passing track. At most locations this is attached to the mast of the signal,—the high signal of course indicating "Stop" when the take siding indication is displayed.

To indicate to the crew of a train on a passing track that they may line the switch and head-out, a dwarf light signal is located near the fouling point. This dwarf signal has a frosted white unit with a while letter "S" and yellow and red units. The white letter "S" indicates that the main line switch may be thrown, after which, if the lever is still in the proper position and the track unoccupied, the red and "S" lights go out and the yellow light is displayed. This yellow light authorizes the train to move from the passing track to the main line and to the next signal. * * *

An Example of Time Saved

An illustration of how easily meeting points can be changed may be of interest. One night No. 32, the Southland, northbound for Chicago, was delayed unexpectedly between Fort Valley and the end of double track at Carman. This train must meet No. 3, a passenger train, for Columbus and No. 11, a passenger train for Montgomery, which are scheduled five minutes apart. The dispatcher first told the operator at Byron to head in No. 3 and No. 11 at Echeconnee for the Southland, based on Fort Valley's "O. S." of that train. A little later he asked where No. 32 was, and the operator replied that it had not "dropped the approach indicator for Carman yet," but that No. 3 was on the approach to Echeconnee. The dispatcher immediately said: "Run 3 and 11 to Byron for 32." This was done. A few minutes later a similar inquiry resulted in information to the dispatcher that No. 32 had not reached the approach track circuit to Carman and No. 3 and No. 11 were advanced to Powersville, the operator being further instructed not to clear the eastbound signal at Carman unless No. 32 was shown approaching it before No. 3 was shown approaching Powersville. The result was that No. 3 and No. 11 went to Carman for No. 32. The intended meeting point was changed three times without issuing an order and without communication with the train against which the other trains were advanced and which under time table rights would have been superior by direction; in fact, without any communication with any of the three trains involved further than issuing instructions by means of the signals. The dispatcher said that had this occurred a few days before when trains were operated on train orders, both No. 3 and No. 11 would have been delayed at least 30 min.

A Typical Day's Operation

The chart of the train movements as directed by signal indication for a three-hour period of July 6, 1927, was plotted from data taken at the controlling stations. Indicators showed the passage of a train at various points more clearly than is possible where trains are "O. S." by operators at their stations. It is of particular interest in showing the exact time each train

cleared the main line when taking siding and also just when it started to move out of the siding. Extra 580 is known as the "Peach Local" and had work to do at Bliss, Ohio, Powersville, Byron, Echeconnee and Walden.

Ten trains were handled practically all the way through in this three-hour period—four passenger trains, five through freights and extra 580 that had more work to do than the usual local freight. This gives an idea of the way traffic was handled during the peak of 1927. Ten trains in three hours is at the rate of 80 trains a day and the chart shows that more could have been handled without serious delay. As 52 trains is the maximum we have had in any one day since this signal system has been in operation, it is clear that we have the facilities for handling a substantial increase in the volume of business. Furthermore the arrangement is such that other switches can be equipped with low-voltage switch machines with a minimum change in the signal apparatus.

An Economic Study

In making an economic study of the results obtained from the installation it was decided to compare the months of September, 1926, and 1927 as typical of 11 months of the year, and one week of heavy traffic in 1926 with one week of the same traffic in 1927 as typical of one month in the year. As previously stated, the peach season is the time of heaviest traffic and while that lasts from six weeks to two months, the traffic is not uniformly heavy throughout and therefore with a view of being conservative the week will be considered as typical of only one month.

It was thought at first that the basis of comparison should be the running time between Terra Cotta and

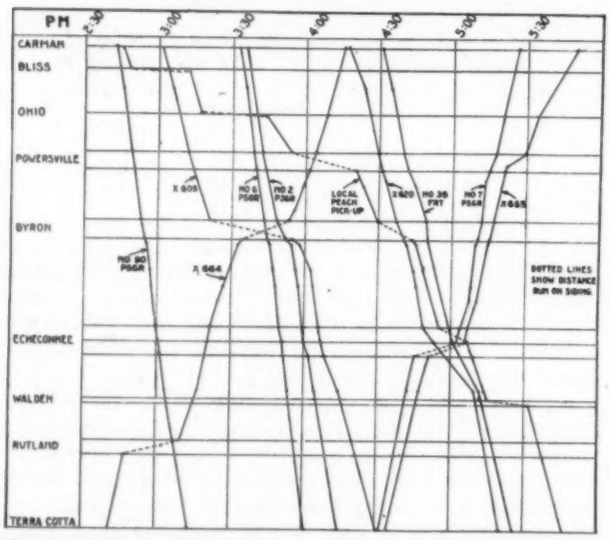


Chart of Train Movements on Signal Indication Between Carman and Terra Cotta, Ga., on July 6, 1927

Fort Valley. Going into the matter carefully, it became evident that this would not be a fair comparison, as there were advantages that would not be covered by this method. A train might be held at Fort Valley or Terra Cotta under train orders for another train and then run through without a stop, making excellent time between these two points, while under the present method the train would be advanced but have to take siding somewhere in this territory, thus taking a longer time between those points but reaching its terminal possibly 30 min. to an hour earlier. Obviously the time that counts is the time on duty reaching the terminal, and that was the basis used.

Comparing the actual operation in September, 1926, and September, 1927, it was found that traffic was somewhat heavier in 1926 than in 1927. However, a careful check showed that on the days of heaviest traffic in 1926 trains made faster time than the average for the month, so that the slight increase in traffic over 1927 had no noticeable bearing on the results.

It was found, too, that in 1927 greater tonnage was handled per train and also that some of the through freights did some local work, so that fewer local freights were run. The result was that the increase in speed of the through freights in 1927 was not so marked as it would have been had these trains been operated strictly as through trains on the same basis as in the previous year. It was therefore decided that since part of the local work was done by through freights, it was fair to give this method of operation credit for the difference in local freight train hours.

In September, 1927, the 354 through freights averaged 15 min. less time than in September, 1926. This is a reduction of 88.5 hr. in fuel burning time. Fuel and water on this division for this month averaged $3.07 per freight train-hour. There was, therefore, a saving in fuel and water of $271.

In September, 1927, 37 through freights made a total of 49 hr. and 43 min. overtime, while in September, 1926, 55 through freights made 58 hr. and 13 min. overtime. However, as there were more trains in 1926, we will consider the saving in overtime as only the 15 min. difference in average running time applied to the 37 trains actually making overtime, or 9.25 hr. at $5.76 per hour equals $53. Savings in wages of local freight crews amounted to $1,225.11. This, combined with the $53 saved on overtime for through freights, makes a pay roll saving of $1,278.

There was a saving in local freight train time of 216 hrs. While $3.07 is the cost of fuel and water per freight train-hour, it is probable that the consumption is not as great per hour for local freights, but there can be no question of its being at least 50 per cent of that of through freights. We will, therefore, consider the cost of fuel and water for the local freights as only $1.50 per hour. At this price the saving in fuel and water during the month for local freights amounted to $324. This, combined with the $271 saved on water and fuel of through freights, makes a total fuel and water saving for the month of $595.

During the month eastbound trains brought 8,270 cars into Macon and westbound trains handled 8,193 cars, making a total of 16,463 cars handled on through freights in this territory. A saving in time of 15 min. amounts to 4,116 car-hours, or 171 car-days. It is, therefore, fair to assume a saving in per diem of $171 per month.

We have, then, a monthly saving as follows:

Wages of train and engine crews	$1,278
Fuel and water	595
Per diem	171
Total	$2,044

No doubt there is a cash saving in repairs to locomotives and freight cars by reducing the number of train stops. It is practically impossible to determine how many train stops are eliminated as a result of this signal rearrangement and rather than approximate a cash saving on an estimated basis that might be questioned, we will simply class this saving as intangible.

A few comparative statistics for the months of Sep-

tember 1926, and 1927 for this whole division may be of interest.

	1926	1927
Freight train miles per hour	13.1	13.9
Miles per car, per day	39.88	48.04
Gross ton-miles per train-hour	14,747.00	16,475.00

It is not claimed that the operation by signal indication in this short territory is entirely responsible for these increases in operating efficiency, but it is obvious that this method of operation contributed toward this result.

Comparison of a Week for Each Year

For the purpose of comparison during the peach season a week in 1926 and a week in 1927 were selected in which the traffic was just as near equal as it was possible to find. During the week in 1926 there were 183 through freights and six locals, and in 1927 there were 181 through freights and six locals. The average running time of through freights, terminal to terminal, was 1 hr. and 25 min. less in 1927 than in 1926, or a total saving in time of 254 hr. and 53 min. The average running time of local freights was 2 hr. and 52 min. less, or a total saving of 27 hr. and 31. In through freight service in 1926, engine crews made 232 hr. 19 min. overtime against 61 hr. and 51 min. in 1927, a saving of 170 hr. and 28 min,, while train crews made 235 hr. 47 min. overtime in 1926 against 59 hr. 31 min. in 1927, a saving of 176 hr. 16 min. In local freight service in 1926 engine crews made 23 hr. and 15 min. overtime against 6 hr. 40 min. in 1927, a saving of 16 hr. and 35 min., while train crews made 21 hr. and 55 min. overtime in 1926 against 5 hr. and 40 min. in 1927, a saving of 16 hr. and 15 min. Turning the savings in fuel, water and overtime hours for this week into money, we have the following:

Fuel and water for through freights	$820.78
Fuel and water for local freights	44.27
Total saving in fuel and water for the week	$865.05

(Cost of fuel and water slightly higher in July than in September.)

Saving in crew overtime:

Local train crew	$ 91.63	
Local engine crew	44.38	
Saving, overtime, local freights		$ 136.01
Through train crews	$562.74	
Through engine crews	437.25	
Saving, overtime, through freights		$ 999.99
Saving in crew overtime for week		$1,136.00

During this week 6,809 cars were handled in this territory with an average saving in time of 1 hr. and 24 min., making a saving in car-time of 9,532 hr. or 397 car-days. On the basis of $1 per day this saving amounted to $397 for the week.

Per diem is strictly not the right expression for car hire, particularly at this time of the year when fresh fruit is in transit in large quantities. These cars must make their schedule or the road failing to make schedule is responsible for any claim that may be made for damages due to delay in transit. In this connection, a check made by the chief dispatcher of this division for a 60-day period in 1926 showed that a section of an eastbound perishable freight was late into Macon 19 times. In 1927 for a 60-day period, when the same number of cars of peaches were handled, only one section of one such train was late. From this it would appear that the arrival of a car at a terminal one hour earlier is worth more than the 4.2 cents used above as the value of a car-hour. Certainly any yardmaster would say this was a low figure. The intangible savings increase, too, during the period of heavy traffic. It is a help in the roundhouse to get the engines in an hour earlier, and when the peak is reached fewer locomotives have to be used in a class of service for which they are not economical. The chief dispatcher of an adjacent division said recently that he was getting trains from this division at Macon nearer on reported time than formerly and therefore he called his crews closer, which is a big help when they double the line each day.

To return to our figures, which it must be admitted do not show the entire saving:

Fuel and water	$ 865
Train crew overtime	1,136
Per diem	397
Total of three items	$2,398

For a four-week period this amounts to $9,592. During this time of the year there were five operators less between Macon and Fort Valley in 1927 than in 1926. The saving was:

Straight time for these 5 operators for 30 days each at 61 cents per hour	$ 732
Overtime saving of operators effected by signal system in July	356
Total saving in operators' payroll	$1,088

This, with the saving of $9,592 above, makes a total saving for the month of $10,680.

Summary of Savings

11 months @ $2,044	$22,484
1 month @ $10,680	10,680
Gross saving for year	$33,164

The cost of the installation was $94,000. The annual charges for interest, depreciation and the additional cost of maintenance and operation of the signal system are estimated at $12,900. This makes a net annual saving of $20,264, which is over 21 per cent

The Engineers Were Remembered at the Baltimore & Ohio Exposition

return on the investment.

As stated above, the intention has been to use conservative figures and it is certain that there are real savings that have not been included. Further, as traffic increases the savings will be larger, and it has been shown that the system can successfully handle a large increase above the peak of the heavy traffic period of the year 1927.

The estimated cost of double tracking was about $2,500,000. It therefore seems clear that operation of trains by signal indication has proven economical and a good investment for a road to make in advance of the time it actually becomes necessary to double track. Further, by postponing double tracking until a considerably greater traffic is reached, the large expenditure in the construction of an additional main line when finally made will be done at a time when greater use can be made of the new track, so that at its completion a larger return will be earned on the investment for double track.

Economic Advantages of Signals on the Seaboard*

By O. R. Teague
Superintendent, Seaboard Air Line

THE SEABOARD Air Line installed color-light automatic block signals on 254 miles of line from Richmond, Va., to Hamlet, N. C., during the latter part of 1925 and the first four months of 1926. The line is single track, except two short sections of double track of approximately nine miles each. The territory is hilly and has a number of 1.1 per cent grades, and numerous curves, with maximum curvature not over six degrees.

Train movements had previously been directed by time tables and train rules, with the manual block; absolute for all opposing movements and for passenger trains; permissive only for following freight movements, except three short sections of frequent curves and grades, where absolute block was required for all trains. Under manual block the maximum distance between block stations was 6.2 miles, the minimum, 1.4 miles, and the average, 4.2 miles apart. The average distance between automatic signals is 1.8 miles.

The Florida traffic, both passenger and freight, is operated over this territory at high speed, and there is but limited "drag train" traffic. The maximum passenger traffic moves from November 15 to May 1, and the heavy freight traffic extends from November until late July. The increase in population and business in the extreme south for the past three years is more uniform traffic throughout the year. Since the signals were completed, the monthly volume of traffic has been practically uniform.

With an average of about 33 train movements per day, all of which, except local passenger and local freight, are high class, the necessity for signals is evident. Certainly safety and facility of movements were considered, and no doubt relief from congestion was expected. It is doubtful if economy was considered to any great extent. However, as shown in the following discussion, there have been gratifying results in operation during the first year.

A Definite Study of the Benefits

When making an economic study of the benefits of this signal installation the time of trains shown is from the first "OS" station to the last one entering a terminal. In this way no terminal time is involved, either before or with signals. Care was exercised to select typical weeks for corresponding periods when the number of trains and conditions were as nearly identical and representative of actual conditions as possible. Many studies were considered showing better operation for a certain district, but more favorable to automatic signals. For instance, we found many full month periods where the time of through freight trains was from 80 to 98 min. less than in the previous year, but the period used, shows only 56 min. improvement over a previous period between Raleigh and Hamlet. Further, we also used a period when the number of trains run not only was the same as in the previous year, but represented approximately the average number for both years—before and after signals were installed.

There was an average of four trains per day less for the period prior to signals; therefore, the improvement in time absorbed, shows the effect of additional trains and still shows creditable reduced time on the road. The statement shows an improvement in the time of passenger and express trains, but no effort has been made to determine or claim any economy from this service. The savings shown are entirely from freight train operation, except the reduction of telegraph offices and of accidents.

Improved Train Operation of Passenger and Through Freight Trains—Per Cent on Time

Month	Year	Division	Passenger	Freight
February	1925	Virginia	86.6	89.1
February	1927	Virginia	99.2	100.0
May	1925	Virginia	98.2	99.6
May	1927	Virginia	100.0	100.0
February	1925	North Carolina	86.0	95.3
February	1927	North Carolina	98.3	97.1
May	1925	North Carolina	96.3	98.6
May	1927	North Carolina	98.2	100.0

Frequently these two divisions now have 100 per cent on-time operation of all passenger and high-class (carded or manifest) trains, which was unheard of prior to the installation of signals. The train hour reclaimed value of $18 per hour, represents wages, fuel, maintenance of equipment, and other items, and is not far from our estimate of the cost of a freight train hour when overtime is involved. We have recently made a study of the value of an hour reclaimed in freight service and feel it to be nearer $21 than $18, not including per diem; therefore, Exhibit A is conservative at least.

"19" Train Order Eliminates Stops

When automatic signals were installed we immediately discontinued the "31" train order, using the "19" train order, saving many train stops daily. However, no account has been kept to determine the saving from this source; possibly the $18 per train hour takes care of this.

Exhibit B shows the extent to which train stops appear to have been eliminated, both passenger and freight, and on the basis of 10 min. per stop and

*Other articles concerning this installation of signals were published as follows: *Railway Age*, July 16, 1927, pg. 91; *Railway Signaling*, February, 1927, pg. 48; *Railway Signaling*, January, 1926, pg. 45.

$18 per hour, the amount involved for freight trains only.

Our division superintendents have made their own studies of the reduced cost of operation and have frequently placed this amount at $25,000 per month, or $300,000 per year. Therefore, $265,000, shown on this study, is below their estimate.

No operating changes have occurred to involve this study, except on the two northern districts—Richmond-Norlina and Norlina-Johnson street, where two new passing sidings have been built; at two points, a second passing siding added and at seven stations the passing sidings have been extended to from 65 to 100 cars capacity. Notwithstanding, the division officers consider it too high, we have deducted 12 per cent for these new facilities.

It is a fact that a few new booster Mikados have replaced non-booster engines on each division, permitting a slightly increased train load. However, this study does not claim increased car or tonnage as a result of signals. We probably have been greatly benefited from this source as the train load has increased as indicated in the table.

Table Showing Increase in Train Load

	Raleigh-Richmond		Raleigh-Hamlet	
Period	Per cent of	Gross Tons	Per cent of	Gross Tons
First 6	Engine	Per Crew	Engine	Per Crew
Months	Rating	Hour	Rating	Hour
1925	91.0	18,036	86.9	15,832
1926	86.7	19,546	88.0	16,866
First 4 Months				
1927	96.3	20,718	91.3	18,224

Speed Per Hour Totally Within Territory Signaled

Year	All Trains M. P. H.	Through Freight Trains Only M. P. H.
1925	18.96	13.00
1927	21.33	14.95

In making this study we were surprised to find a slight reduction in the "straight time" paid in through freight service, notwithstanding that there was an increase in through freight train miles. On investigation this was found to be due to extending all freight train runs, cutting out a number of trips of 56 miles which called for 44 miles arbitrary payment. In other words, prior to the installation of signals, it was not practicable to run drag freight trains from Raleigh to Portsmouth—173 miles—via Norlina, on account of the slow movement from Johnson street to Norlina. With signals this is done daily, thereby saving 44 miles for each trip between Raleigh and Norlina, and an equal amount on the return trip. Following the change there has been a material reduction of yard and enginehouse expense at Norlina.

Accidents Prevented

A study of every accident for 10 years prior to the installation of signals was made, being careful to eliminate all accidents within terminal yards, and considering only those accidents which plainly would have been prevented by the use of signals. We found an average monthly cost of $5,053. This cost not only includes property damage but all claim settlements, both personal and freight damage.

While no accidents have occurred since signals were put in service, we do know of instances where signals prevented trains leaving stations before the arrival of trains they had momentarily overlooked; also trains have been stopped on account of broken rails.

On one occasion an operator reported his northbound "head block" signal displaying a "Stop" indication. He ascertained from the dispatcher that there was no train in the block; and called the section crew, who found nearly three feet of rail broken and entirely off the ties. In the meantime the signal held one of our limited trains, which no doubt would have had a disastrous wreck without the aid of the signals.

On another date our Birmingham-Washington Special, Train No. 6, was approaching Bracey, about five o'clock in the morning, and found "Stop" signals. The train stopped, and then proceeded according to rules, and found a slide in a deep cut on a curve just south of the station. The slide, principally dirt with some boulder rock, set the signals to "Stop," which no doubt saved a serious accident.

For year ending February 28, 1927, signals have indicated the following: 27 rail failures, 12 open switches or switch points, 10 cars fouling clearances, 5 derails out of position.

Signals Help to Keep Trains Moving

Many interesting illustrations could be given where trains were kept moving under automatic signals, which would under the manual block, have been delayed, and in some instances tied up by the 16-hour law. We recall a heavy coal train at Kittrell, running ahead of No. 9 (The Limited), which proceeded to Franklinton, cleared according to the rule, following No. 9 promptly, ahead of No. 309, another high-class passenger train, to Lake Forest, there meeting No. 8 and 46, and then proceeded to Raleigh Yard without difficulty; in the meantime meeting two sections of No. 80, perishable trains. Under manual block this coal train would have remained at Kittrell for three hours or more. Similar cases occur almost daily.

Another favorable result is that we can now pass one passenger train around another local or express train with minimum delay. Heretofore, the train passed would sustain a delay of 25 to 40 min., depending on the distance between block stations. Now following movements are close, permitting the train taking siding to be run around, frequently with no delay except to open and close switches and pull through the siding. We have frequently met four trains, two in each direction, at the same siding, and at the same time, put a through train around a local train with scarcely any delay.

Effect of Signals on Dispatchers and Enginemen

We have noted a very gratifying interest on the part of our dispatchers; in some instances they claim a necessary increased alertness in watching all trains to meet them properly or advance inferior against superior trains running late. With many former offices closed, the dispatching seems to improve. The dispatchers are using "head block" or any signals in sight of the operator, from which to gage the movement of trains at distant sidings and signals, and no bad effect is felt in closing many intermediate offices. The dispatchers have more confidence in their work with the protection against oversight or error, and they have a pride in the modern protection provided for trains.

The conductors and trainmen have more confidence in themselves, and no fear of overlooked trains. There is a still greater effect on enginemen. On this crooked hilly territory, with numerous trains to watch out for, there is no question but that the

feeling of security means better movements and less mental strain.

The public in the territory is showing increasing interest in any improvement on the railroad. This especially applies to signals, which they realize are for their protection as well as the employees. The passenger department recognizes this and makes mention of this protection in its advertising.

This signal installation was completed in 1926. The line from Savannah, Ga., to Baldwin, Fla., via Jacksonville, 157 miles, and between Starke, Fla., to Coleman, Fla., 108 miles, has been similarly equipped with signals. All three sections continue to produce gratifying results.

Exhibit A—Automatic Signals, Virginia and North Carolina Divisions

	Rocketts (Richmond) and Norlina	Norlina and Johnson St. (Raleigh)	Johnson St. (Raleigh) and Hamlet	Total
Miles	98.4	87.7	96.1	252.2
Number of signals..	163	105	160	428
Number of stations	23	13	21	57
Number of sidings	24	21	36	81
Average trains per day 1925-a	26	32	29.8	
Average trains per day 1927-b	33	34	33.4	
Hours per train:				
Local freight, 1925-a	9 hr. 17 min.	11 hr. 23 min.	11 hr. 8 min.	
Through freight, 1925-a	6 hr. 38 min.	4 hr. 16 min.	8 hr. 6 min.	
Local freight, 1927-b	6 hr. 36 mni.	8 hr. 34 min.	9 hr. 43 min.	
Through freight, 1927-b	5 hr. 46 min.	3 hr. 37 min.	7 hr. 10 min.	
*Approximate value train hour	$18.00	$18.00	$18.00	
SAVINGS PER WEEK				
Local freight	32 hr.	17 hr.	17 hr.	60 hr.
Thought freight	69 hr.	50 hr.	72 hr.	191 hr.
Total hr. per week (Local and through freight) VALUE OF HOURS SAVED	101 hr.	67 hr.	89 hr.	257 hr.
Per week	$ 1,818	$ 1,206	$ 1,602	$ 4,626
Per annum	†83,192	†55,187	83,304	221,683
Payroll—Savings operators discld	34,337	19,080	15,600	69,017
Savings—Accidents	24,139	11,133	22,800	58,072
Total savings per annum	†141,668	†85,400	121,704	348,772
Operation and maintenance	‡32,716	‡18,140	‡32,436	‡83,292
Net savings	75,198	47,463	56,296	178,949
Interest on expenditure—6 per cent	33,762	19,797	32,972	86,531
Approximate cost of signals	562,693	329,953	549,540	‡1,442,186
Net per cent saving on investment at 6 per cent	13.4	14.4	10.2	12.4

Note:—* 12 per cent deducted account new passing sidings and extensions. † Includes considerable stock on hand not used. ‡ Includes cost of power line; also improvements highway and street crossings and station landings. a 1925 before automatic signals. b 1927 after automatic signals.

No account taken in above of the following savings: Saving in train stops; saving in per diem; saving in locomotive and cars; saving in switch lights. No account taken of possible increase in taxes account betterment to property.

Exhibit B—Reduction of Train Stops by Use of the "19" Order with Automatic Signals

	All Trains	Local Freight Trains	Through Freight Trains	Total
Rocketts (Richmond)-Norlina				
Trains per week	220	12	80	
Decrease in stops per week		36.96	68.80	
At 10 min. per stop—Min.		370	688	1,058
—Hours		6.16	11.46	18.02
At $18.00 per hour—Per week		$ 110.88	$ 206.28	$ 317.16
—Per year		5,765.76	10,726.56	16,492.32
Norlina-Edgeton (Raleigh)				
Trains per week	238	6	104	
Decrease in stops per week		4.50	80.08	
At 10 min. per stop—Min.		45	800	845
—Hours		75	13.33	88.33
At $18.00 per hour—Per week		$ 13.50	$ 239.94	$ 253.44
—Per year		702.00	12,476.88	13,178.88
Johnson St. (Raleigh) Hamlet				
Trains per week	234	12	94	
Decrease in stops per week		17.40	90.24	
At 10 min. per stop—Min.		174	902	1,076
—Hours		2.90	15.03	17.93
At $18.00 per hour—Per week		$ 52.20	$ 270.54	$ 327.74
—Per year		2,714.40	14,068.08	16,782.48

No saving claimed in Exhibit—A for passenger train stops. Savings based on 10 min. saved per train stop. Value of train hour, $18. The above saving has been included in Exhibit—A.

Switch Lamps Discontinued

Division	Number	Monthly Cost of Maintenance, etc.
Virginia	89	$190.00
North Carolina	55	165.00
Total	144	$355.00
Yearly cost		$4,260.00

Switch lights located not more than 300 ft. from automatic signals discontinued. No credit taken for this item in Exhibit—A.

Discussion

[Chairman J. E. Saunders (D. L. & W.), in presenting the report, stated that the committee was particularly interested in installations with sufficient merit to stand out over and above the regular line of signals, and that it was presenting four papers showing outstanding features of railway signaling. The first paper presented on the economic advantages of railway signaling was prepared by O. R. Teague, superintendent of staff of the Seaboard Air Line. F. H. Bagley (S. A. L.), read Mr. Teague's paper in the author's absence. A motion picture was presented showing the actual conditions of train operation by the centralized dispatchers control system on the Ohio division of the New York Central. Conditions of handling train orders resulting in delays were contrasted pictorially with the modern centralized system. B. J. Schwendt, assistant signal engineer (N. Y. C.), explained various scenes shown. This film was shown by the courtesy of the General Railway Signal Co.]

Mr. Schwendt: In the last two issues of *Railway Age* is a report on the improvement in railway operation from 1913 to 1926. The last issue in particular dwells on the improvement in gross ton-miles per train-hour, beginning in 1920 and extending to 1926. It traces this marked improvement to two things, among others, but principally these two: increased power of locomotives, and the signal systems which permit such locomotives to exercise their power.

Chairman Saunders: J. J. Brinkworth, superintendent of this division of the New York Central, is present, and I should like him to say a few words.

Mr. Brinkworth: I believe that in the final analysis the reaction of the operating man to signal installations and particularly signal innovations, is perhaps one of the most important things we want to think about. In single-track operation we list under the term "unavoidable delays" stopping of trains to enter sidings. Years ago that did not mean so much, with only 15, 20 or 30-car trains. Today what do we find? On this particular piece of railroad that you just witnessed in the pictures, we stopped trains consisting of 100 cars of coal, running close to 10,000 adjusted tons, before the signal installation, to permit them to enter a siding. To stop a freight train will cost anywhere from $3 to $5 a stop.

We have gone along for 30 or 40 years under the manual block system on single-track railroads, and have struggled along trying, of course, to overcome them. The worst part of it was that everybody thought that it was just a natural condition.

On this piece of railroad between Berwick and Stanley, a distance of 40 miles, the New York Central and the Big Four operate as a joint railroad. Prior to the coal strike that started in April, 1927, we had a heavy train movement. I believe the conservative figures will run close to 50 trains a day, freight and passenger combined. Prior to this installation [as depicted in motion pictures] we went along under this disease from which we were suffering, and thought we were all right.

It was stated in the motion picture that 50 per

cent of our train meets are non-stop. When that was first called to my attention I thought somebody had exaggerated. I checked it up only yesterday and found that in the month of February, which we have just closed, 70 per cent of our freight train and passenger train meets, or 70 per cent of all our meets, were non-stop meets. You can appreciate the difference between the old system and the new system. The handling of train orders from an operating man's standpoint is a serious one. We read ever so often in the reports of the I. C. C. of train accidents in which train orders were involved. In our system, the engineman must be familiar only with signal aspects (with what they mean) and operate accordingly.

The reduced traffic over this piece of railroad has made it more or less difficult to put into figures how much we have benefited by the system. We can say that we took off $25,000 worth of operators (per year). Any railroad can do the same thing under the same system. In the seven or eight months in which the system has been in use, it has been proved beyond a question of a doubt to be entirely practical. That is what the operating man is interested in. We cannot find any frills about it, we cannot find any operating objection. We have, without question, increased our train speed and increased our gross ton-miles per train-hour.

F. W. Pfleging (U. P.), spoke briefly on 'Saving in Operating Expenses by the Use of Spring Switches in Main Tracks," and showed some motion pictures, quoting also some figures on operating economies, which are given in the accompanying table.

Mr. Saunders: I want to express the appreciation of the committee to all the railroads outside of the committee which did so much work to compile this information, and also to mention particularly the co-operation of the General Railway Signal Company and the Union Switch & Signal Company in the preparation of these slides and motion pictures. Without their co-operation we could not have put it up in the shape we did.

Report of Committee on Signaling Practice

W. M. Post (Penn.)
Chairman
W. E. Boland (S.P.)
W. J. Eck (Sou.)
W. H. Elliott (N.Y.C.)
G. E. Ellis (A.R.A.)
P. M. Gault (M.P.)
J. V. Hanna (K.C.T.)
J. C. Mock (M.C.)
H. G. Morgan (I.C.)

W. M. Post

F. W. Pfleging (U.P.)
Vice-Chairman
J. A. Peabody (C.& N.W.)
A. H. Rudd (Penn.)
T. S. Stevens (A.T.& S.F.)
E. G. Stradling (C.I.& L.)
C. H. Tillett (C.N.)
W. M. Vandersluis (I.C.)
R. C. White (M.P.)
F. B. Wiegand (N.Y.C.)
L. Wyant (C.R.I.& P.)

THE COMMITTEE submitted reports on: Signal aspects, indications and names; Utility and desirability of safety devices other than automatic train control; and Noteworthy advances in signaling practice.

Under Assignment 3 was submitted the recommendations made by Committee X to the Committee on Operating Rules of the Operating Division, A. R. A., in connection with aspects, indications and names for the proposed revised standard code, together with a letter from the chairman to the secretary of the Operating Division explaining the recommendations of Committee X. The Committee on Operating Rules has not as yet included these recommendations in the revised Standard Code.

Referring to the indication in Rule 282: In the proposed Standard Code, Rule 509B is as follows:

509B. When a train is stopped by a Stop and Proceed signal it may proceed
(A) On single track _____.
(B) On two or more tracks at once at restricted speed.

The definition of restricted speed, which has been adopted by the A. R. A. as recommended practice, is as follows:

Proceed prepared to stop short of train, obstruction, or anything that may require the speed of a train to be reduced.

In Exhibits A and B
R = Red
Y = Yellow
G = Green
LW = Lunar White
W = White

Under Assignment 4, A. H. Rudd (Penna.) prepared a report on "Devices Other Than Automatic Train Control."

Under Assignment 5, noteworthy advances in signaling practice, F. B. Wiegand (N. Y. C.) presented as information a brief discription of the principles of the dispatcher-controlled signal system.

Signal Aspects, Indications and Names

The committee's recommendation of signal aspects,

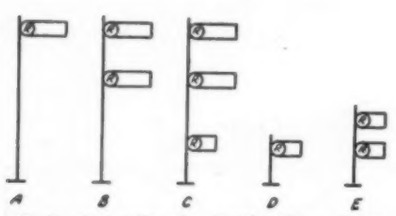
indications and names for semaphore signals are shown herewith; similar diagrams for light signals were also included in the report but are not shown here.

The letter from the chairman to the secretary of the Operating Division relative to signal aspects, indications and names, explaining the recommendations of Committee X, was mailed under date of October 22, 1927, and reads as follows:

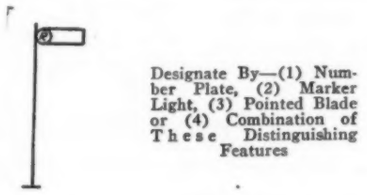
"Committee X, Signal Section, A. R. A., at its meeting held in Chicago, October 18 and 19, 1927, prepared its recommendations for aspects, indication and names of fixed signals for the proposed revision of the Standard Code, which are submitted as Exhibit 'A.' Committee X has previously submitted recommendations for indications and names, but no aspects. These recommendations, with some changes made by the Committee on Train Rules, are shown in the 'Recommended Revision and Consolidation of Manual Block and Controled Manual Block Rules,' dated January 11, 1927. For the purpose of comparison the proposed recommendations (Exhibit 'A') have been given the same rule numbers as shown in the proposed rules dated January 11.

"A suggestion has been made that it would be more logical to arrange the indications, names and aspects so that starting with 'Stop' they will appear consecutively as more favorable indications and aspects are shown. I have shown the proper sequence for this arrangement by numerals starting with number 1 in the lower right-hand corner.

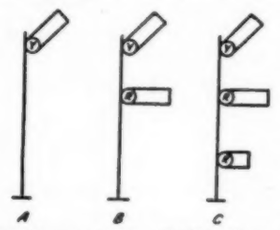
"Committe X has made some changes in the indications and names. These changes are necessary on account of the definition of 'Restricted Speed,' which we understand has been adopted and which is as follows: 'Proceed prepared to stop short of train, obstruction or anything that may require the speed of a train to be reduced.' In the previous recommendations of Committee X the term 'Restricting' was used as indicating a speed between authorized and slow, or about 30 miles per hour. Committee X has decided that it will not offer further objection to the meaning of 'Restricted Speed,' as defined by the Committee on Train Rules. After careful consideration Committee X has used the term 'Medium Speed' as indicating the speed between



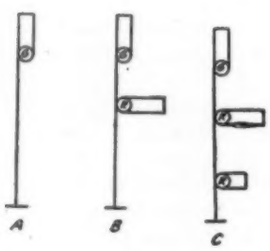
Rule 281 (Stop)—Indication: Stop



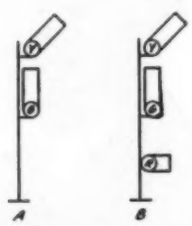
Rule 282 (Stop and Proceed)—Indication: Stop, Then Proceed in Accordance with Rule 509B



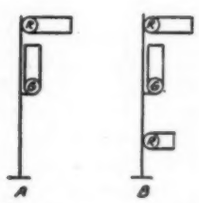
Rule 283 (Approach)—Indication: Prepared to Stop at Next Signal. Train Exceeding Medium Speed Must at Once Reduce to That Speed



Rule 284 (Clear)—Indication: Proceed

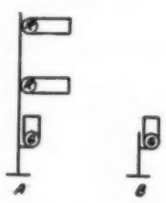


Rule 285 (Approach Medium Speed)—Indication: Approach Next Signal at Not Exceeding Medium Speed



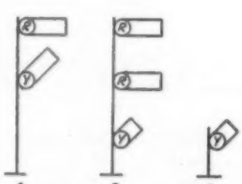
Rule 286 (Clear Medium Speed)—Indication: Proceed at Not Exceeding Medium Speed

Rule 287 (Medium Approach Speed)—Indication: Proceed at Not Exceeding Medium Speed Prepared to Stop at Next Signal

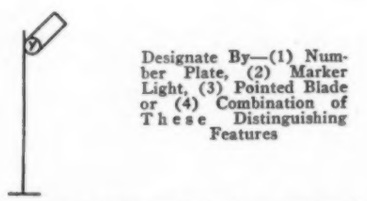


Rule 288 (Clear Slow Speed)—Indication: Proceed at Not Exceeding Slow Speed

Rule 289 (Slow Approach)—Indication: Proceed at Not Exceeding Slow Speed Prepared to Stop at Next Signal



Rule 289A [New Rule] (Restricting)—Indication: Proceed at Restricted Speed



Rule 290 (Permissive)—Indication: Block Occupied, Proceed Prepared to Stop Short of Train Ahead

Rule 291 (Approach Slow Speed)—Indication: Approach Next Signal at Not Exceeding Slow Speed

Day and Night Aspects for Color-Light Signals Shall Have the Same Colors as the Night Aspects of the Semaphore Signals. Day and Night Aspects for Position-Light Signals Shall Have the Same Positions as the Day Aspects of the Semaphore Signals. Aspects Shown Are Typical. Each Road Should Show the Aspects and Colors of Lights It Uses

authorized and slow, or about 30 miles per hour, with the thought that each road will define 'Medium Speed.' It has also used the term 'Slow Speed' with the thought that each road will determine for itself the meaning of 'Slow Speed.'

"You will note that only semaphore aspects are shown for each rule, inasmuch as Committee X has decided that the aspects of color light signals would be the same as the night aspects of semaphore signals and the aspects of position light signals will be the same as the day aspects of semaphore signals. Additional indication, name and aspects are recommended as shown.

"It was voted by Committee X that a supplementary submission shall be made showing the aspects of the color position light signals. These aspects differ quite materially from those of the semaphore, color, or position light signals. A white marker light above the signal indicates normal speed route, below the signal indicates medium speed route and no light indicates slow speed route. While this system differs substantially from the previous signal systems, it has many attractive features.

"Committee X also voted that the attention of the Committee on Train Rules should be called to the additional information that can be conveyed by the fourth position (including downward 45 degrees) of the position light signal.

"If the Committee on Train Rules decides that the color, position and color-position light signals should be shown they can readily be added. The color-light aspect would be the same as the night colors of the semaphores. The position light aspects would be the same as the position of arms as follows:

"Rule 281	Same as 1-arm semaphore aspect (Exhibit 'A').
Rule 282	Same as 1-arm semaphore aspect (Exhibit 'A').
Rule 283	Same as 1-arm semaphore aspect (Exhibit 'A').
Rule 284	Same as 1-arm semaphore aspect (Exhibit 'A').
Rule 285	Same as 2-arm semaphore aspect (Exhibit 'A').
Rule 286	Same as 2-arm semaphore aspect (Exhibit 'A').
Rule 287	No position light aspect.
Rule 288	Same as dwarf signal aspect.
Rule 289	No position light aspect.
Rule 289A	Same as 289A (Exhibit 'B').
Rule 290	Same as 1-arm semaphore aspect (Exhibit 'A').
Rule 291	No position light aspect.

"Additional position light aspects, indications and names are shown in Exhibit 'B.'

"Rule 292	Caution signal.
Rule 293	Clear block signal."

Discussion

[Chairman W. M. Post (Penna.) presented the report and covered the subject as far as semaphore and color-light signal aspects before adjournment of the afternoon's session.]

Chairman Post: The Committe on Operating Rules has been for several years revising a standard code and this committtee has been asked to co-operate with it in supplying the names, indications and aspects. There have been some differences of opinion between the committee but we believe that they have been or will soon be adjusted. Committee X, at its last meeting, had 17 of the 21 members present, and they agreed, with the exception of T. S. Stevens (A. T. & S. F.) who asked to be recorded as not voting, on the indications, names and aspects submitted today. It is the purpose of Committee X at the meeting with the Committee on Operating Rules next week, to submit the names, indications and aspects as they appear here unless some changes are suggested in the meantime.

G. H. Dryden (B. & O.): Consider Rule 285, Name —"Approach Medium Speed," and Rule 286, Name— "Clear Medium Speed." To compare these, the first requires a reduction of speed at the signal beyond. The second requires a reduction of speed at this signal. I suggest that Rule 286 be changed to "Medium Clear" instead of "Clear Medium Speed." Rule 285 should stand as you have it, "Approach Medium Speed." I think the engineman's interpretation of the meaning of the signal at the time he calls it and the action that shall be taken by the engineman immediately upon the name of the signal being called, is important. Clear medium speed and approach medium speed seem to me to present the danger of a conflict. "Approach medium speed;" means that no action is to be taken at this point, prepare to take action beyond. "Medium clear" would mean immediate action should be taken.

A. H. Rudd (Penna.): If we change Rule 285, how are we going to change 284? All these names are consistent for these cases.

E. N. Fox (B. & M.): I think if Rule 286 were simply called medium speed, it would take care of Mr. Dryden's criticism.

Chairman Post: I think the committee believes the word clear should appear there to differentiate, from approach in the rule just preceding.

J. J. Corcoran (N. Y. C.): I understand Rule 289-A requires the same speed through the block as Rule 282. Is that correct?

Chairman Post: Rule 282 is commonly known as an automatic signal.

Mr. Corcoran: Is it not the same speed through the block? It is not "Proceed at Restricted Speed?" The point I wish to make is that under Rule 282 the special provision is made for this indication for the speed through the block in single track territory, but if indication 289-A is used in single track territory, no provision is made.

Chairman Post: It might be used as an automatic signal.

Mr. Corcoran: We saw the signal used just for that purpose on the screen today. If any of these aspects are to be used in single track territory, it would seem that a rule similar to 509-A should be provided. If all these are on two or more tracks, it is not needed.

Chairman Post: We can talk that over with the Rules Committee when we meet with them. It would seem that if there is this indication, Rule 509-A would apply.

With reference to Rule 290, the second paragraph, "Day and night aspects for position-light signals shall have the same positions as the day aspects of the semaphore signals," Mr. Rudd suggests that be eliminated because that is not what is commonly used for that indication and name. The committee decided that the color-light aspects and the position-light aspects would in all cases follow the semaphore signal. In actual practice it does not follow the semaphore signal.

Mr. Rudd: In Rule 290-A the same indication is shown and has the same name, but a different aspect is displayed. There is no use of retaining that note, because it is not true. I move the committee eliminate it.

E. P. Weatherby (T. & P.): Rule 290 uses exactly the same aspect that is used on Rule 283-A.

Chairman Post: With this difference, that it says "Designate by letter plate or marker light or shape of arm or combination of these distinguishing features. This is the aspect of a manual block signal, and the committee is suggesting it be marked. It has suggested four ways of marking. The marking, however, of an automatic signal has no significance except when the signal is in the stop and proceed position.

Mr. Weatherby: On our road we use the A. P. B. system of signaling and we designate the absolute signals by leaving off the number plate.

Chairman Post: Then it wouldn't be on in the approach position.

Mr. Rudd: Rule 281, (Aspect A) is an indication to stop. That is an absolute head block system. There is no provision for a number plate on it.

[The committee adjourned at this point to resume discussion of the report Tuesday morning.]

Little Rollo and His Pop*

Chapter I. Wherein the deliberations of the Signal Section are given the once-over by our hero

"WELL, Pop," said Rollo breathlessly, as they staggered into the north ballroom, "here we are at last."

Rollo, and his Pop as well, was breathless for a good reason. After a hearty breakfast in Ye Olde Junke Shoppe in the basement, the father and son decided to proceed at once to the convention. Pop knew that it was in the ballroom. They went to the east ballroom, they went to the west ballroom. Then they asked bell-boys, chamber-maids, elevator men and distinguished looking characters (who afterwards turned out to be signal men). Everyone asked knew all about it, with the result that they found themselves successively in the northwest ballroom, the southwest ballroom, and the north by northeast ballroom. At last they asked a dark man, with glasses, who said he didn't know, and, following his directions, they found the proper ballroom at once.

"Where does this bunch usually meet?" piped Rollo, as soon as they were seated.

"They come to Chicago once a year," said his Pop, indulgently, "the other meeting is held in Los Angeles, Cal., Montreal, P. Q., Swampscott, Mass., West Baden, Ind., and other centrally located points."

"Oh, I see," responded the youngster, "Join the signal section and see the world."

"Shut up," said his parent sternly as he clouted him alongside of the ear.

But Rollo was not so easily quieted as all that. After kicking his Pop deftly in the shins, he inquired:

"Who's that wealthy-looking man over there in the corner?"

Much surprised at hearing anyone at a railway meeting described as wealthy, Pop followed Rollo's pointing finger.

"Oh, that's Bert Anderson," he said, "And your description is a very apt one. He is wealthy, or at least he ought to be; he's a railway supply man now."

Just then somebody on the floor mentioned the intermittent inductive type. Rollo was all ears at once. "Pop," he cried, "you know everything. Tell me, what's an intermittent inductive type?"

"Well, er, hm," said his Pop, "I'll tell you. It's like this. When the impedance bond neutralizes the forestaller, the key-bys on the circuit closing switch are magnetized by the signal case. The permissive feature of the track magnet is governed by the forestalling valve. Similarly, the iron inductive core is secondary, and the stick relay contact offers a path of lower reluctance through the spark arrester. The circuit controller, induced by the collapse of the magnetic fields, actuates the spark arrester, while the cut-off valve is intercommunicating. The space interval installed in the transformer at point B, magnetizes the plunger-box door, as shown in Fig. 1. Do you see?"

"Oh, is that what it is?" said Rollo brightly, as seven signal men sitting nearby fell off their chairs.

Rollo was quiet, but only for a minute. Presently, he espied two gentlemen over in the corner. His bright little eyes surveyed them up and down, missing nothing, as usual.

"Pop, say, Pop," he cried, "there's two birds who have been arguing for half an hour. Are they going to fight."

Pop squinted along the side of his nose at the gentlemen in question.

"Oh, no, my boy," he replied, "they're not going to fight. That's just 'Flasher-Light' Rudd and 'Wig-Wag' McKeen arguing on their pet subject. Mr. Rudd is chairman and Mr. McKeen is a member of the special committee on highway crossing protection, and they agree perfectly, to disagree. Look carefully at Mr. Rudd, my boy. He's a man of achievement, one in a century, in fact. Right before your very eyes is the only man who has ever succeeded in getting humor into a committee report. Mr. Rudd accomplished this seemingly impossible feat in his report on highway crossing protection at the A. R. E. A. last year."

Rollo continued his bright remarks and Pop his answers, until time for the annual lunch, where, by reason of their speed and agility, they obtained good seats. The singing impressed Rollo very much.

"Are these professional entertainers?" he inquired.

"No," said Pop, "they're all signal men."

"Say, Pop," interpolated Rollo, "there must be something to these guys after all. They sure can sing."

"Ah, why bring that up?" said Pop, who had been listening to the Black Crow records.

"But, I want to know who these sweet singers are," persisted Rollo, "such talent should not go entirely unnoticed."

"It won't," said Pop, "the gentleman over there with the long hair is music critics for the *Railway Age* and he'll have a full report of it in tomorrow's daily."

During the afternoon, Rollo continued his cross-examination, bringing to light many things, for example, that a gentleman named Peabody of the Chicago & North Western, had changed his mind in public, before the Interstate Commerce Commission in fact, in regard to the use of wayside signals with automatic train control. Pop told little Rollo all this and also related to him, the story that put this change of mind across, you know, the one about the man and the mule. Shortly after four, food and the movies beckoned Rollo and his Pop, and they turned in early, so as to be in the best of shape to meet with the A. R. E. A. in the morning.

*Editor's Note.—A well-known chief engineer, who was once (Heaven help him) a signal engineer, has brought his young son, Rollo, to the convention. Rollo, in common with most youths of his age, asks questions about everything and anything. A *Railway Age* representative was fortunate enouch to secure the exclusive rights (including the Scandinavian) to reproduce Rollo's artless prattle and here it is.

Numerous Changes in Signal Section Personnel During Year

CHANGES in signal personnel since March, 1927, have resulted in the appointment of four committee chairmen in the Signal Section. Some of these changes followed the appointment of five new signal engineers. During the same interval, the Section lost two prominent members through the death of Frank P. Patenall, signal engineer of the Baltimore & Ohio and Sidney U. Rhymer, signal engineer of the Chicago & Alton.

Four new assignments in committee chairmanships were made since last March. B. T. Anderson, superintendent of signals of the Chesapeake & Ohio was succeeded by W. M. Post, assistant chief signal engineer of the Pennsylvania, as chairman of Committee X—Signaling Practice. Mr. Post is a past chairman of the Signal Section (1926) and a member of Committee I—Economics of Railway Signaling. G. H. Dryden, signal engineer of the Baltimore & Ohio, replaced A. H. Rice, signal engineer, Delaware & Hudson, as chairman of Committee IX—Overhead & Underground Lines. Mr. Dryden is also a member of Committee VIII—A-C. Automatic Block Signaling. E. T. Ambach, assistant signal engineer, Baltimore & Ohio, succeeded F. W. Pfleging, signal engineer, Union Pacific, as chairman of Committee III—Power Interlocking. A. H. McKeen, system signal engineer, Union Pacific, succeeded E. K. Post, signal engineer, Pennsylvania, as chairman of Committee VI—Designs.

Mr. Patenall was one of the pioneers in the old Railway Signal Association and was equally active in its successor, the Signal Section, A. R. A. He is credited with introducing numerous original ideas into American signaling practice and with the invention in 1903 of the upper-quadrant semaphore signal. The color-position-light signal was also introduced by Mr. Patenall. At the time of his death Mr. Patenall was a member of the Special Committee on Highway Crossing Protection, Committee X—Signaling Practice, and Committee VI—Designs. Mr. Patenall has been succeeded by George H. Dryden, formerly principal assistant signal engineer, Baltimore & Ohio, who is a member of Committee VIII—A-C. Automatic Block Signaling, and chairman of Committee IX—Overhead & Underground Lines.

Sidney U. Rhymer, signal engineer of the Chicago & Alton, was a member of Committee XI—Chemicals. He has been succeeded by H. C. Sampson, formerly signal supervisor of the Northern division of the Alton.

Two signal engineers left the ranks of the railroads to enter the signal supply industry as did also one assistant signal engineer. Burt T. Anderson resigned as superintendent of signals of the Chesapeake & Ohio, on September 1, 1927, to become assistant to the vice-president and general manager of the Union Switch & Signal Company. At the time he left railway service, Mr. Anderson was chairman of Committee X—Signaling Practice and had just relinquished the post of chairman of Committee I—Economics of Railway Signaling. His record of committee associations began in 1913 as chairman of the Committee on Power Interlocking, followed by service as vice-chairman of Committee VIII—A-C. Automatic Signaling in 1914, a member of Committee VIII in 1915 and 1923, chairman of Committee XIX—Economics of Railway Signaling in 1922 (now Committee I); member of Committee IX—Wires and Cables in 1922, member of the Nominating Committee in 1920; and election to second vice-chairman, Signal Section, A. R. A., in 1921; first vice-chairman and chairman of the Committee on Committees in 1922, and chairman of the Signal Section in 1923.

E. W. Kolb resigned as signal engineer of the Buffalo, Rochester & Pittsburgh in May, 1927, to become manager of commercial testing and inspection for the General Railway Signal Company. He was an active member of Committee XI—Chemicals and was particularly instrumental in drafting specifications for primary batteries.

Robert M. Phinney, assistant signal engineer of the Chicago & North Western, left this road on January 1, 1928, to join the commercial engineering department of the General Railway Signal Company. Mr. Phinney had been active in committee work and until recently was a member of Committee IV— D-C. Automatic Signaling.

Signal engineers promoted to ranking positions on their respective railroads during the past 12 months include, in addition to Mr. Dryden and Mr. Sampson, C. A. Taylor, signal engineer of the Chesapeake & Ohio, who replaced Mr. Anderson in September, 1927, W. L. Connors, signal engineer of the Buffalo, Rochester & Pittsburgh, who succeeded Mr. Kolb in May, 1927, and L. A. Guthrie, who has been appointed acting signal engineer, Canadian National, Western region. Harry H. Orr, signal engineer, Chicago & Eastern Illinois, was appointed superintendent of signals and telegraph on July 1, 1927. Mr. Orr is a member of the Special Committee on Highway Crossing Protection, and the Committee of Direction.

Changes in A. R. E. A. Personnel in Last Year

DURING THE year that has elapsed since the last convention of the American Railway Engineering Association there have been many changes in the status of the members, one having been advanced to the presidency of the road with which he was connected, while another was elected vice-president of an important railway in the East. A number of other members were promoted to execute positions or to more important posts in the executive and engineering fields, while four left railway service to enter allied lines of business. Thirty members, including a past president, the treasurer of the association, the first treasurer and several other members of long standing were taken by death, of whom four where charter members.

C. E. Johnston, a director of the association and a member since 1917, was elected to the presidency of the Kansas City Southern on January 1. Mr. Johnston has always taken an active interest in the work of the Committee on the Economics of Railway Labor, of which committee he has been a member for 10 years and for which he is peculiarly fitted by the constructive work he carried out in this respect when he was vice-president and general manager of the K. C. S.

Charles E. Smith, consulting engineer, who has been a member since 1908, was elected vice-president of the New York, New Haven & Hartford during the year, in

which position he will assist the president in matters pertaining to improvements, construction and operation. Mr. Smith brings to this task much valuable experience gained in the studies of and reports on terminal problems in St. Louis and other important railway centers of the country.

W. J. Backes, formerly engineer maintenance of way of the Boston & Maine, was promoted to chief engineer during the year. Mr. Backes has been a member of the association since 1917 and has been a member of the Committee on Rail for six years. He was appointed a director during the year to fill the vacancy created by the resignation of J. DeN. Macomb. H. C. Mann, formerly assistant chief engineer of the Union Pacific System, was advanced to chief engineer on January 1, and on the same date, P. C. Newbegin, maintenance engineer of the Bangor & Aroostook, was promoted to chief engineer of that road.

John V. Neubert, a director of the association and formerly engineer maintenance of way of the New York Central (Buffalo and East), was promoted to the newly created position of chief engineer maintenance of way of the New York Central and the Ohio Central Lines of that system. Mr. Neubert, who has been a member of the association for 12 years, has been chairman of the important Committee on Track for the last three years.

The retirements from active service include three who have been members for periods ranging from 21 to 25 years. R. L. Huntley, who became member No. 495 in 1903, retired as chief engineer of the Union Pacific on January 1, and on the same date, Moses Burpee, chief engineer of the Bangor & Aroostook, was retired at his own request at the age of 81 to become consulting engineer of that road. Mr. Burpee joined the association in 1907 and his membership number is 820. W. Atlee James, No. 625, assistant chief engineer of the Western Lines of the Canadian Pacific, who became a member in 1905, also retired on the first of the year.

During the last year death has taken a number of the older members whose active interest in the affairs of the association in its earlier years did much to bring it to its present standing. C. F. W. Felt, a charter member who was No. 44 in the list of members and president in 1926, died on February 4, after an extended illness which compelled him to take a leave of absence from duties as chief engineer of the Atchison, Topeka & Santa Fe System last November. Mr. Felt was a member of the Committee on Rail from 1922 to 1925, inclusive, and contributed largely to the studies of internal fissures, being chairman of the sub-committee which participated with the U. S. Bureau of Standards in a joint investigation of this subject in 1923-1924. W. S. Dawley, No. 28, consulting engineer, who was the first treasurer of the association; Charles B. Hoyt, No. 160, retired superintendent of track on the New York, Chicago & St. Louis, and G. A. Mountain, No. 279, retired chief engineer of the Canadian Railway Commission, were other charter members who died during the year. George H. Bremner, treasurer of the association since 1912 and a member since 1904, died on April 2. Mr. Bremner was a member of the Committee on Roadway for several years, of which committee he was later chairman. He also served on the Committee on Track and was a member of the Special Committee on Stresses in Railroad Track at the time of his death. E. O. Faulkner, No. 588, formerly manager of the tie and timber department of the Atchison, Topeka & Santa Fe, died on December 17. W. H. Hoyt, No. 707, chief engineer of the Duluth, Missabe & Northern, and F. P. Patenall, No. 789, signal engineer of the Baltimore & Ohio, who joined the association in 1906 and 1907, respectively, were other members of long standing who were called by death.

Among the members holding high executive positions who died during the year were S. Davies Warfield, president of the Seaboard Air Line; W. P. Bruce, vice-president and general manager of the Nashville, Chattanooga & St. Louis, and F. P. Pelter, vice-president and general manager of the Norfolk Southern.

Among the members who left railway service to enter other lines of business are J. DeN. Macomb, who was elected a director at the last convention, and who has been a member of the Committee on Track for the last nine years. Mr. Macomb is now assistant to the vice-president of the Inland Steel Company. J. H. Waterman, who retired as superintendent of timber preservation on the Chicago, Burlington & Quincy during the last year and who has been an active member of the Committee on Wood Preservation for 11 years, is now special agent for the Curtin Howe Corporation, while B. T. Anderson, chairman of the Committee on Interlocking and Signaling, and a member of that committee since 1923, resigned as superintendent of signals on the Chesapeake & Ohio, to become assistant to the vice-president and general manager of the Union Switch & Signal Company.

A. R. E. A. Gains Recognition

THE WORK of the American Railway Engineering Association is so largely of a technical nature, that there is little about it which appeals to popular imagination. It makes poor newspaper copy, with the result that the association receives but scant mention in the daily press. It is to be questioned whether there is any association of equal size or caliber whose name is known to fewer laymen than is that of the A. R. E. A.

This has been a matter of no consequence to its members and officers, for they realize that the association has an enviable standing where such standing counts, namely among the men who direct the destinies of the railroads of North America. During the past year, however, the association and its personnel received marked recognition from a most unusual source; one which was entirely unthought of by those who are responsible for the service which brought it into being.

A Duty and an Opportunity

The year 1927 will be recalled for generations as the year of the great flood in the Mississippi valley, and the victims of that disaster have good reason to remember the part played by railway men in carrying on the work of relief and restoration. Recognizing the outstanding nature of this service and the importance of an accurate record of all flood data in so far as they concerned the railways, and realizing that this was fundamentally engineers' work, the A. R. E. A. took upon itself the task of making such a record. The rest is well known to all members. A special committee, composed of chief engineers of railroads traversing the flooded area, was appointed by President Brumley to prepare a detailed report on the flood. This was published in Bulletin 297 for July, 1927, and again in revised and amplified form in Bulletin 306 for January, 1928.

This report was recognized at once as an outstand-

ing achievement of the association, but no one realized the importance which would be attached to it outside of railroad circles. Copies of the earlier bulletin, falling into the hands of members of Congress, were read with avidity and when hearings on flood control were undertaken, railway engineers were called to Washington to testify before committees. Later distinct recognition was given to the association in an invitation to select members to represent it on a joint committee of engineers to co-operate in the work of the Congressional flood control committee.

Recognition in Other Fields

Contrasted with this achievement other affairs of the association during the past years suffered a distinct eclipse, although there is much which testifies to its standing outside of its own field. Thus, it is commonly assumed that highway bridge design and construction are purely incidental items in the work of the railway bridge engineer, nevertheless representatives of Committee XV have been at work for several years on a joint committee with state and national highway engineers for the purpose of drafting a standard specification for highway bridges. This specification is now ready for submission to the members of the participating organizations. The standing of the association is also apparent in the invitation to participate in the conduct of a test of a reinforced concrete highway bridge, as a result of which J. B. Hunley, engineer of bridges and structures of the Cleveland, Cincinnati, Chicago & St. Louis was appointed to represent the association on an advisory committee to arrange for the methods and procedure of carrying out this test.

Criticism of the method of conducting the association's conventions, made at the meeting a year ago, has been fruitful of a careful study of the entire convention procedure by a special committee appointed by the board of direction. This committee, of which R. H. Ford, assistant chief engineer, Chicago, Rock Island & Pacific, is the chairman, has done an enormous amount of work, in the course of which all suggestions received from the members have been carefully considered. The work of this committee has been crystallized in a report made to the board of direction which has also given the subject careful thought and the conclusions reached are to be announced during the course of the convention.

Transverse Fissures

Among other activities of the association which have been brought definitely to a head during the course of the past year, is the development of the Sperry transverse fissure detector. After demonstrations showing the effectiveness of this device under laboratory conditions, arrangements were made to conduct tests of this machine in a portable form whereby it is hoped to detect the presence of transverse fissures in the rails of operated tracks.

Greater participation in the work of the association by its members is seen in an increase from 659 to 715 in the number of the members who serve on the 26 standing and special committees. While several railroads are represented by a considerable number of men, notably the New York Central with 39 and the Illinois Central with 36, the fact remains that an even 100 railroads have men actively engaged in the work of these committees and that in the case of large representation by individual roads, this is distributed through a great many of the committees rather than in concentration in a few. The membership of the association has been increased by 96 during the year and now totals 2,607. Among the new members is one woman, the first to be entered on the rolls, namely Miss Olive Wetzel Dennis, engineer of service on the staff of President Willard of the Baltimore & Ohio and a graduate in civil engineering of Cornell University.

No change was made in the number of committees during the year, but several suggestions have been made for some revision of the present makeup of committees, including the consolidation of two committees dealing with inter-related subjects, the assignment of additional work to another committee and the creation of a new one to undertake the study of a subject not previously embraced in the work of the association. It is anticipated that the decision of the board of direction with respect to these suggestions will be announced after, if not during, the present convention.

Changes in Personnel

For the first time in eight years a change has been made in the position of treasurer. Following the death of George H. Bremner on April 2, 1927, who had occupied this position since 1910, F. J. Stimson, assistant chief engineer maintenance, Pennsylvania, Western region, was appointed to fill the vacancy. Two changes were also made in the directorate during the year. W. J. Backus, chief engineer of the Boston & Maine, was appointed a director to fill the unexpired term of J. de N. Macomb, who resigned following the acceptance of a position outside of railway service. J. E. Armstrong, assistant engineer, Canadian Pacific, was appointed a director for the unexpired term of Frank Lee, who resigned because of a transfer to headquarters on the Pacific Coast.

The reports of the 22 regular and 2 special committees which are to be presented at the convention this year, occupy 880 pages as compared with 1,194 pages for the reports submitted at the convention last year. The reduction of 314 pages in the volume of matter submitted for consideration by the convention will be welcomed generally by those in attendance, since it insures more detailed consideration of the material presented.

Signal Section Registration

THE OFFICIAL registration of members and guests of the Signal Section, A. R. A., yesterday aggregated 491 members and 61 guests, or a total of 552. This compares with a first day of registration of 644 last year and 350 in 1926.

Alphabetical List of Members

Members

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Lundy, B. A., vice-pres., Railroad Accessories Corp., New York City.

M

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McCready, H., asst. east. mgr., Union Switch & Signal Co., New York City.
McCarthy, D. J., chf. engr., Chicago Railway Signal & Supply Co., Chicago.
McConahay, J. F., sig. supvr., C. M. & St. P., Milwaukee, Wis.
McCaulley, C. G., vice-pres., E. A. Lundy Co., Pittsburgh, Pa.
McCormick, C. B., serv. engr., sig. serv., Electric Storage Battery Co., Chicago.
McDonald, J. E., sig. supva., D. W. & P. (Can. Nat., Central Region), Virginia, Minn.
McEnery, J. A., sig. supvr., Can. Pac., East, McAdam, N. B., Can.
McKeen, A. H., system sig. engr., U. P., Omaha, Nebr.
McNeill, E. H., sales engr., The Okonite Co., Chicago.
Massie, J. F., sig. supvr., L. & N., Knoxville, Tenn.
Manuel, W. N., rep., Corning Glass Works, Corning, N. Y.
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Milligan, H. F., supt., C. C. C. & St. L., Mattoon, Ill.
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Miles, E. L., dist. asst. sig. supvr., N. Y. C., Elkhart, Ind.
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Mitchell, C. A., supt. N. Y. N. H. & H., Hartford, Conn.
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Moore, J. H., sig. supvr., B. R. & P., Warsaw, N. Y.
Morgan, H. G., sig. engr., I. C., Chicago.
Morsch, J. F., sig. supvr., Jacksonville Terminal Co., Jacksonville, Fla.
Morrison, C. H., sig. engr., N. Y. N. H. & H., New Haven, Conn.
Morris, D. R., supvr. sig., A. C. L., Waycross, Ga.
Rochester, N. Y.
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Murphy, M. E., sig. inspr., C. & E. I., Danville, Ill.
Murphy, W. L., asst. sig. supvr., N. Y. C., Englewood, Ill.
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N

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O'Neil, C. P., supvr. sigs., T. T., Toledo, O.
O'Neil, C. P., supvr. sigs., T. T., Toledo, Ohio.
Oppelt, J. H., supvr. sigs., N. Y. C. & St. L., Cleveland, O.
Owen, L. E., office engr., sig. dept., St. L.-S. F., Springfield, Mo.

P

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Parnell, L., sig. supvr., Wabash, Montpelier, O.
Patton, G. J., sig. supvr., D. L. & W., Newark, N. J.
Patterson, A. J., sig. supvr., H. V., Columbus, O.
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Pendorf, P. G., sales engr., National Carbon Co., East Orange, N. J.
Persinger, C., supvr. sigs., C. & O., Covington, Ky.
Peterson, G. A., sig. inspr., Wabash, Decatur, Ill.
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Pflasterer, G. S., sig. engr., N. C. & St. L., Nashville, Tenn.
Pflasterer, H. B., R. R. sales engr., S. F. Bowser & Co., Inc., Chicago.
Pflasterer, W. R., mgr. R. R. sales, U. S. Graphite Co., Chicago.
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Pickett, H. G., gen. sig. inspr., F. E. C., St. Augustine, Fla.
Pla, R. A., sig. & elec. inspr., Southern, Washington, D. C.
Porter, L. B., asst. sig. engr., C. M. & St. P., Milwaukee, Wis.
Post, E. K., sig. engr., Penna., Philadelphia, Pa.
Price, H. C., gen. sig. inspr., Erie, Youngstown, O.
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R

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Rife, W. H., sig. supvr., A. T. & S. F., LaJunta, Colo.
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Scott, H. S., gen. for. constr., I. C., Chicago.
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Smith, E. B., asst. sig. engr., N. Y. C., East, New York City.
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Vliet, P., gen. for. tel. & sigs., W. & L. E., Brewster, O.

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Wright, J. T., supvr. sigs., G. T. W. (Can. Nat., Central Region), Detroit, Mich.
Wyant, L., sig. engr., C. R. I. & P., Chicago.

Y

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Yewell, J. E., chf. draftsman, B. & L. E., Greenville, Pa.
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Z

Zane, W. F., sig. engr., C. B. & Q., Chicago.

Guests

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Macpherson, K. P., mgr. wire and cable sales dept., Northern Electric Co., Ltd., Toronto, Ont.
Mathley, M. B., dist. mgr., Roller Smith Co., Chicago.
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Moore, W. S., engr. m. of w., L. H. & St. L., Louisville, Ky.
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Rogers, F. J., Little Rock, Ark.
Rothschild, J., sec., American Ass'n R. R. Supts., St. Louis, Mo.
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Taylor, E. L., asst. to vice-pres., N. Y., N. H. & H., New Haven, Conn.
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Wardell, F. N., asst. engr., N. Y. C., New York City.
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Williams, R. A., sales engr., American Car & Foundry Co., St. Louis, Mo.
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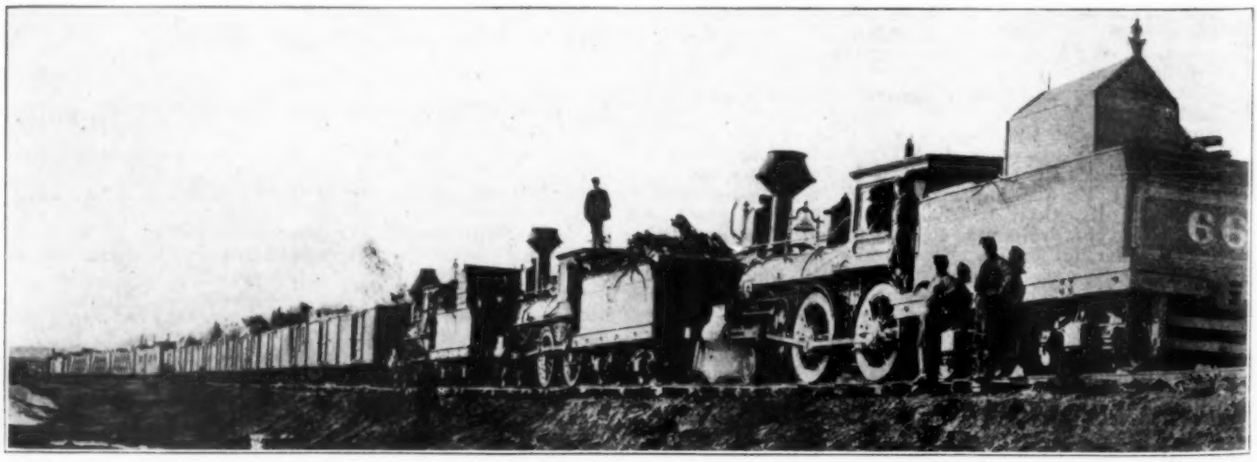
A New Committee

At a meeting of the Board of Direction of the A. R. E. A. last January the creation of a special Committee on Rivers and Harbors was authorized and the following subjects assigned:

Report upon methods for providing against river bank erosion; determine the best types of construction for levees and river dikes for flood protection, giving recommended dimensions; determine the proper allowance for swell in scow measurement dredge work; determine the proper amount of allowable over-depth in dredging operations to obtain the desired operating depth; determine the average deposit in fresh water rivers bearing silt and in brackish waters within the tidal range; prescribe the best approved method of taking soundings in river waters, in tidal waters, with both hard and soft bottoms; ascertain the usual slope taken in deep waterways for quiet waters and for those affected by wave action; and determine the effect of slight salinity on deposit of silt in rivers and slips.

At the same time the following personnel was selected for this committee: Col. Wm. G. Atwood, chairman, consulting engineer; W. H. Kirkbride, vice-chairman, engineer maintenance of way and structures, S. P.; W. J. Backes, chief engineer, B. & M.; A. F. Blaess, chief engineer, I. C.; W. H. Courtenay, chief engineer, L & N.; E. A. Hadley, chief engineer, M. P.; W. E. Hawley, assistant engineer, D. M. & N.; F. G. Jonah, chief engineer, St. L.-S. F.; J. L. Kirby, engineer maintenance of way, S. A. L.; G A. Noren, engineering assistant to vice-president, N. Y. C.; E. H. Roth, assistant engineer, N. & W.; and R. C. Young, chief engineer, L. S. & I.

A number of suggestions have also been made of late relative to the consolidation of certain committees of the A. R. E. A. and the creation of new committees. Among the consolidations proposed were that of the Committees on Wooden Bridges and Trestles with that on Iron and Steel Structures, while new committees suggested included those on Sanitation and on Docks and Wharves. At the meeting of the Board of Direction yesterday it was decided not to consolidate the committee on Wooden Bridges and Trestles with that on Iron and Steel Structures, but to assign to it such subjects relating to docks and wharves as warranted consideration from time to time. It was also decided to assign sanitation subjects to the Water Service committee.



The Construction Train Used in Building Much of the Union Pacific

Railway Appliances Exhibit Opens

Record amount of space at Coliseum display devoted to 188 *exhibitors —Manufacturers show* 160 *new devices*

THE EXHIBIT of the National Railway Appliances Association, which opened at the Coliseum yesterday morning with devices of 188 manufacturers of materials used in the construction and maintenance of railway tracks, structures and signals on display, occupies a floor space more than 10 times as great as that required for a similar exposition 21 years ago. The last exhibit of the Roadway and Track Association, the predecessor of the present Appliances association, was held in the Auditorium hotel in 1907 with a total of 15 manufacturers exhibiting. In the next year the present association was formed and the exhibit was moved to the Coliseum for the first time. From this small beginning it has grown steadily each year until now it occupies every available inch of space in that building.

Of the more than 700 devices on display more than 160 are being shown for the first time this year. The number of exhibitors is equal to but does not exceed that of 1926 and 1927, largely because of the limitation of space. In arranging the space in the Coliseum and in the two annexes, C. W. Kelly, secretary and treasurer of the National Railway Appliance Association, and his assistants, reduced the size of the booths and found room for nine additional spaces. As in 1927 it was necessary to refuse the applications of 32 manufacturers who wished to place their products on display.

Copenhagen blue and gold form the basis of the color scheme used in the decoration of the panels separating the exhibits and in the general decorations and drapes. The false vaulted ceiling of the main hall, made up of these two colors, is surmounted at the apex by a wide band of a multitude of colors which, when viewed from either end of the room, presents a rainbow effect. In the two annex halls Copenhagen blue and gold predominate in the general decoration scheme.

The restaurant, located last year in the basement, has been moved to the space designated as the ballroom, on the second floor over the South hall, where a new kitchen and dining room has been set up. As in the exhibit halls the dining room has been decorated in Copenhagen blue and gold. This new location, with its access to natural light, affords a more attractive setting for a dining room than the former basement room.

All entrances to the Coliseum are protected by canopies extending over the sidewalks and are marked with appropriate signs of the exhibition. The north hall serves as the main entrance, with the south hall as the main exit. Telephones are available in the center of the Wabash avenue side of the building and registration for members of the Association is in the customary place at the office of the secretary.

Invitations have been issued to over 11,000 railroad officers, engineering societies, Interstate Commerce Commission employees and engineering colleges. In addition, 100,000 passes have been distributed among the exhibitors. The Coliseum will be open each day from 8 a. m. to 6 p. m., except on Tuesday, when the doors will remain open until 10 p. m. The exhibition will close after four days, at 3 p. m., on Thursday.

The officers and members of the board of directors of the National Railway Appliance Association who completed a year of service with the election of a new group yesterday morning are: L. E. Weidman, Frog,

L. E. Weidman
President

Mr. Weidman has had an active part in the exhibits of the National Railway Appliances Association since 1920, when he first served as the representative of an exhibitor. He became a director five years ago, was advanced to vice-president in 1926 and was elected president last year. The officers and directors of the N. R. A. A. must be able to divorce the individual interests of their own firms when dealing with the affairs of the association. They must be able to visualize the exhibit as a whole and base their decisions solely on considerations of common good to all. It is needless to say that Mr. Weidman's selection as president was based on the fulfillment of these qualifications and that he has had the whole-hearted cooperation of the other officers and the directors during the past year. Mr. Weidman is vice-president of the Frog, Switch & Manufacturing Company, Carlisle, Pa., with which he has been associated for the past 24 years.

of the National Railway Appliance Association who completed a year of service with the election of a new group yesterday morning are: L. E. Weidman, Frog, Switch & Manufacturing Co., Carlisle, Pa., president; A. L. Greenabaum, O. F. Jordan Company, East Chicago, Ind., vice-president; C. W. Kelly, Chicago, secretary-treasurer and director of exhibits; W. B. Murray, Miller Train Control Corporation, Washington, D. C., honorary director; F. M. Hartley, Jr., National Lead Company, New York, M. C. Beymer, Oxweld Railroad Service Company, Chicago, S. P. McGough, Lorain Steel Company, Johnstown, Pa., A. S. Anderson, Adams & Westlake Co., Chicago, J. W. Fogg, MacLean-Fogg Nut Company, Chicago, and B. L. Winchell, Jr., Kerite Insulated Wire & Cable Co., New York, directors.

A list of the firms which are presenting exhibits, with the devices on display and the numbered location of their booths, is given below. Those devices exhibited for the first time are shown in bold face type.

List of Exhibitors

A C Spark Plug Company, Flint, Mich.—Spark plugs; air cleaners; oil filters; speedometers; fuel pressure system for feeding gasoline to carburetor; thermogages; ammeters; oil gages; instrument boards for automobiles and buses. Represented by W. S. Isherwood, Prosper Champion and R. Saunders. Space 168½.

Adams Motor & Manufacturing Co., Chicago.—Gasoline operated railway motor cars; light center-load **motor car.** Represented by W. E. Adams, R. S. Adams, W. A. Bailey and W. M. McClintock. Spaces 218 and 218½.

Adams & Westlake Co., Chicago.—Highway crossing signals; semaphore lamps; switch lamps; classification lamps; marker lamps; lanterns; switch locks. Represented by A. S. Anderson, E. Andrew, R. D. John, E. H. Leisch, W. J. Pearson, W. G. Porter, H. G. Turney, G. L. Walters, R. D. Whitlock and Howard Seipp. Spaces 96, 97, 79 and 80.

Air Reduction Sales Company, New York.—Oxygen; acetylene; oxyacetylene welding and cutting torches and supplies; carbide; carbide lamps. Represented by E. M. Sexton, B. N. Law, R. T. Peabody, H. L. Rogers, T. M. Hamer, C. A. Daly, J. W. Kenefic and G. Van Alstyne. Spaces 167, 167½ and 168.

American Cable Company, New York.—Preformed wire **rope;** wire rope slings. Represented by G. C. Moon, C. D. Meals, W. H. Slingluff, R. J. Cole, L. Lockwood and G. A. Faerber. Space 102.

American Car & Foundry Co., Chicago.—Electric rivet heaters; **bottom connecting rods.** Represented by A. G. Wood, F. C. Cheston and H. C. Cheston. Space 259.

American Casting Company, Birmingham, Ala.—Lock joint cast iron culvert pipe; spiral corrugated cast iron culvert pipe; cast iron headwalls. Represented by D. B. Dimick and Thomas Bellsnyder. Space 260.

American Chain Company, New York.—One piece guard rail of solid type; one piece guard rail with renewable inserts; compromise joint; drop forged guard rail clamp; cast steel guard rail clamp; rail bender; combination guard rail brace and clamp. Represented by J. J. O'Connell, W. I. Cook, A. H. Weston, A. P. Van Schaik and W. C. Wolfe. Spaces 81 and 82.

American Fork & Hoe Co., Cleveland, Ohio.—Rail anchors; tapered rail joint; shims; special tamping forks; scuffle hoes; stone hooks; **ballast tamping forks.** Represented by W. Withington, A. F. Fifield, J. Christie, J. H. Dooling, G. E. Geer, S. L. Henderson, E Keough, J G. Miller, J. Nolan, J. T. Regan, F. C. Stowell and R. C. Violett. Spaces 235 and 236.

American Hoist & Derrick Co., St. Paul, Minn.—Locomotive ditchers, locomotive cranes, pile drivers, supply train crane and shovel crane illustrated by photographs. Represented by Miss H. M. Hoeller, W. B. Maurer, Arthur Craine, G. G. Prest, C. T. Hook, J. L. Hickey and Noe Parenteau. Space 88½.

American Railway Hydrant & Valve Co., Stapleton, Staten Island, N. Y.—Non-freezible water hydrants, cocks and valves; miscellaneous water service supplies and tools; **self-closing faucet.** Represented by William Volkhardt. Space 160.

American Steel & Wire Co., Chicago.—Right of way fences; rail bonds; signal wires and cables; welding wire; steel posts; **dirt set end and corner posts.** Represented by H. A. Squibbs, Frank Thomson, L. P. Shanahan, T. Hassell, C. A. Cochrane, H. S. Lockwood, A. W. Froude, C. S. Knight, C. F. Wiley, H. Barthell, Frank Conklin, John May, H. H. Febrey, B. B. Ayres, W. H. Cordes and R. E. Francisco. Spaces 265 and 278.

American Valve & Meter Co., Cincinnati, Ohio.—Water Column; drop spout; telescopic spout; switch stand; interlocking switch stand; safety appliances; **rail and flange lubricator; stock drencher.** Represented by J. T. McGarry, Jas. W. McGarry, D. J. Higgins, Harry Z. Meginnis, J. DePinal, C. W. Stevens and L. Norvell. Spaces 130, 131, 132 and 133.

Ames Shovel & Tool Co., Boston, Mass.—Track shovels with turned steps, flat points and fitted with various kinds of handles. Represented by M. L. Wright, Albert C. Heath, Jr., and N. E. Brooks. Space 8¾.

Anchor Company, Milwaukee, Wis.—Rail anchors. Represented by C. C. Hopkins, Clarence Knapp and W. D. Achuff. Spaces 163½ and 164.

Armco Culvert Manufacturers' Association, Middletown, Ohio.—Perforated pipe; automatic drainage gate; **paved invert pipe; new standard fittings.** Represented by W. R. Fraser, H. D. Sheets, N. A. Powell, T. Scott, E. T. Cross, J. L. Youngs, C. W. Diltz, C. E. Hise, J. R. Wilks, E. C. Campbell, Robert Barnham, O. C. Burgess and A. S. Rosing. Spaces 99 and 100.

Baker-Raulang Company, Cleveland, Ohio.—Electric industrial tractors, trucks and cranes. Represented by W. F. Hebard, T. W. Barnes, B. C. Hooper, H. B. Greig and M. A. Watterson. Spaces 205 and 210.

Barber Asphalt Company, Philadelphia, Pa.—Model of Barret Company, New York.—Prepared shingles; roofing materials. Represented by H. F. Altheide, Walter Buehler, W. F. Doriot, E. R. Eckholm, J. L. Glancey, J. E. Haynes, F. S. Nichols, G. R. Osterland and F. M. Strawn. Space 189. crossing constructed of cold repair cement; asphalt shingles, roofing and paints. Represented by George D. Fowle. Space 163.

Beall Brothers, Alton, Ill.—Track shovels; locomotive scoops. Represented by E. H. Beall and C. K. Wightman. Space 248.

Beall Tool Company, East Alton, Ill.—Spring or lock washers. Represented by M. J. Konald and J. F. W. Kruse. Space 255.

Bethlehem Steel Company, Bethlehem, Pa.—Switch stands, models 51, 53 and 1222; hook flange guard rail gauge rods; rail anchors; **paving guard; adjustable rail brace; hydraulic check for spring switches.** Represented by N. E. Salsich, J. F. Hennessy, H. W. Prindle, R. P. Deghuee, G. H. Riddle, F. Huffman, R. L. Gillespie, E. B. C. Goyne, J. V. Honeycutt, R. Knibloe, C. A. Alden, Oliver Johnson, W. W. Philler, J. W. Stoever, C. L. Moses, J. H. Budd, H. E. Stoll, J. Toler, R. Payson, N. M. Stark, Charles Owen, M. A. Vickers, W. C. Chapman, A. Koch and W. B. Pritchard. Spaces 70½, 71, 71½ and 72.

Binks Spray Equipment Company, Chicago.—Paint spraying equipment; self-propelled combination motor car air compressor unit and paint spray outfit. Represented by M. Sullivan, Gerald Hale, O. D. Soellner, B. R. Sausen, H. D. Binks, M. J. Binks, Harry Binks, Jr., E. E. Mayers and P. H. Peterson. Spaces 151 and 152.

Brown Rail Loader Company, Boston, Mass.—Air-operated rail loader. Represented by James C. Barr and William B. Joyce. Spaces 45, 46, 47, 64, 65 and 66.

Blaw-Knox Company, Pittsburgh, Pa.—Clamshell buckets; steel buildings; steel forms; steel floor grating; **steam purifiers.** Represented by Gus Schrimer, O. M. Parker, E. L. Harrington and J. L. Jones. Space 89.

Brach Manufacturing Corporation, L. S., Newark, N. J.—Neon-vacuum and non-air-gap lightning arresters; highway grade crossing signals; semaphore and highway grade lamps; electric lamp adapters; terminal blocks; resistance units, insulated binding posts; **pole line arrester; break arm; stop-go signal; binding post insulator; electric gate lamp; cable hangers; two-bulb cut-in relay semaphore lamp; unifone; loud speaking telephone outfit; electric gate lamp.** Represented by L. S. Brach, G. Gort, Frank Faeth, Frank Lepreau, G. S. Pritchard and W. H. DeChant. Spaces 182 and 183.

Buda Company, Harvey, Ill.—Motor cars; earth drills; electric locomotive headlights; bumping posts; rolled and pressed steel wheels; switch stands; ratchet and ball bearing jacks; track liners; car replacers; tool grinders; track and bonding drills; track gages and levels; crossing gates; power plants; frogs; switches; crossings; **No. 619 improved**

B. L. Winchell, Jr., Director

J. W. Fogg, Director

F. M. Hartley, Jr., Director

A. L. Greenabaum,
Vice-President

W. B. Murray,
Honorary Director

C. W. Kelly,
Secretary-Treasurer

M. C. Beymer, Director

S. P. McGough, Director

A. S. Anderson, Director

Officers of the National Railway Appliances Association

motor car; tie spacers; diesel engines. Represented by J. L. Artmaier, R. B. Fisher, G. A. Secor, H. P. Bayley, J. J. Gard, H. M. Sloan, H. C. Beebe, W. H. Haas, L. O. Stratton, R. M. Blackburn, G. W. Hoover, L. M. Viles, A. L. Bliss, W. P. Hunt, A. J. Walch, R. Brietenfeld, P. L. Laughlin, E. H. Walker, H. S. Browns, F. W. Marvel, J. H. Weare, C. H. Bull, J. R. Mayeskie, W. S. Weston, E. J. Conant, H. L. Miller, C. W. Wood, A. H. Deimel, D. C. Feterson, J. S. Dempsey and F. E. Place. Spaces 45, 46, 47, 64, 65 and 66.

Carbic Manufacturing Company, Duluth, Minn.—Flare lights and generators; reception booth. Represented by R. R. Browning, C. B. Moore, M. C. Beymer, E. S. Richardson, F. H. Haggerson, G. B. Walker, F. C. Hasse, G. P. Bogert, H. X. Gigandet, W. Leighton, J. G. Tawse, H. W. Schulze, W. Jones, W. A. Hogan, A. N. Lucas, G. M. Crownover, C. S. Wright and L. C. Ryan. Spaces 165, 166 and 166½.

Philip Carey Company, Cincinnati, Ohio.—Bridge flooring; track pavement; **trunking.** Represented by G. C. Garland, S. L. Stokes, V. R. Muth, Eugene Keller, A. Worrall, J. J. Fenstermaker, H. W. Wagner, T. J. Herron, R. H. Shaw and H. L. Rogers. Spaces 129 and 148.

Carnegie Steel Company, Pittsburgh, Pa.—Rails; rail joints; wrought steel wheels; beam sections. Represented by J. F. Miller, R. E. Maxwell, L. C. Lustenberger, A. C. Jack, T. L. Watson, J. C. Taggart, Jr., F. L. Beesley, J. C. Shields, R. L. Twitchell and R. G. Schreiner. Spaces 268 and 275.

Carter Bloxonend Flooring Company, Kansas City, Mo.—End-grain flooring for baggage and express cars, shops and freight stations. Represented by C. J. Carter, J. G. Galvin, A. E. Giese and John Thomasma. Space 4.

Celotex Company, Chicago.—Panels showing types of insulating material and their uses; **lath.** Represented by E. E. Kelly, J. H. Bracken and H. A. Winandy. Spaces 6 and 7.

Chicago Bridge & Iron Works, Chicago.—Steel tanks. Represented by M. J. Trees, L. McDonald, R. Green, J. C. Vosburgh, E. E. Alt, .C M. Ladd, E. P. Shelton, R. L. Hilton, H. C. Brown, C. H. Scheman, M. E. Smith and J. W. Wheary. Space 85.

Chicago Flag & Decorating Co., Chicago.—Signal flags; signal bunting; flag holder. Represented by George L. Glendon and L. G. Magnusson. Space 186.

Chicago Pneumatic Tool Company, New York.—Self-propelled air compressor; tie tampers; track devices. Represented by J. L. Rowe, E. K. Lynch and D. E. Cooke. Spaces 122 and 123.

Chicago Railway Signal & Supply Co., Chicago.—Color light block signals; flashing railroad crossing signals; neutral and polarized relays; interlocking relays; flashing relays; sheet steel instrument cases; **color light block signals, equipped with adjustable focusing brackets and focus finder.** Represented by C. O. Poor, A. C. Dunne, D. J. McCarthy, C. Rath and C. Suhr. Spaces 108½ and 109.

Chipman Chemical Engineering Company, Inc., Bound Brook, N. J.—Geared-to-the-axle spray equipment for weed killer; automatic and self-regulating device which discharges an exact dosage, pump accelerating with speed of the train. Represented by R. N. Chipman, W. H. Moyer, J. D. Ruttan, A. F. Devault, H. Cunningham and W. W. Dines. Spaces 50½ and 51.

Clark Car Company, Pittsburgh, Pa.—Extension side dump cars. Represented by R. W. Anderson, W. G. Swift and J. L. Desch. Space 115.

Cleveland Frog & Crossing Co., Cleveland, Ohio.—Represented by G. C. Lucas, L. G. Parker, Geo. A. Peabody, H. I. Prentice, E. W. Goodaire and J. A. Donahey. Space 90.

Cleveland Pneumatic Tool Company, Cleveland, Ohio.—Pneumatic tools; chipping hammers; track drills; miscellaneous; **back-fill tampers.** Represented by H. S. Covey, Arthur Scott, C. J. Albert and R. E. Ahern. Space 144.

Cleveland Railway Supply Company, Cleveland, Ohio.—Manganese one piece guard rail; safety foot guard; flangeway guards; switch stand. Represented by W. H. Neeson, H. P. Blum, F. A. Peck and H. Stephens. Spaces 289 and 290.

Concrete Tie Company, Pittsburgh, Pa.—**Reinforced concrete cross tie.** Represented by N. F. Brown. Space 159½.

Copperweld Steel Company, Glassport, Pa.—Sample installations of guy strand, messenger wire, fence catenary, ground rods, anchor rods; **farm fence for right-of-way fencing.** Represented by Stanton Hertz, Rolf Selquist, W. J. McIlvane, A. M. Kremkau, G. F. Bain, Paul Van Wagner, E. G. Elg, W. W. Ege, W. W. Martin, N. V. Clark and C. J. Spindler. Spaces 190 and 191.

Creepcheck Company, Inc., Hoboken, N. J.—Unit one-piece anti-creeper. Represented by T. D. Crowley, Frank Reagan, R. R. Dinklage and H. A. Howell. Spaces 228, 229 and 230.

Crerar, Adams & Co., Chicago.—Track drills; bonding drills; handles; snaiths; die starters; **air jacks; electric drills; rethreading tools.** Represented by E. C. Poehler, G. D. Bassett, W. L. Reidell, R. M. Bullard, R. C. Bracken, J. M. Temple and Russell Wallace. Space 28.

Cullen-Friestedt Company, Chicago.—One hundred and eighty-degree steel burro crane; yielding barrier gate; track gager; **full revolving steel burro crane.** Represented by W. C. Bamber, K. J. Beller, T. D. Crowley, E. V. Cullen, F. J. Cullen, F. P. Cullen, D. W. Dodge, C. F. Ennes, T. G. Frazee, R. W. Payne, T. J. Powell, F. J. Reagan, E. J. Shaughnessy and C. H. Wood. Space 142.

Curtin-Howe Corporation, New York.—**Timbers treated with zinc meta-arsenite.** Represented by C. M. Taylor, J. H. Waterman and E. H. Walker. Space 193.

Cyclone Fench Company, Waukegan, Ill.—Chain link property protection fencing; wrought iron inner-track fencing. Represented by J. H. Kinney, H. G. Chapman and E. W. Greene. Space 247.

Dearborn Chemical Company, Chicago.—Water treating plant; scientific water treating preparations for prevention of scale, corrosion and foaming in steam boilers; rust preventitive. Represented by George R. Carr, C. M. Hoffman, E. M. Converse, Fred B. Horstmann, W. D. Bennett, O. H. Rehmeyer and H. B. Crocker. Spaces 251 and 252.

Detroit Graphite Company, Chicago.—Paints; painting systems. Represented by T. R. Wyles, P. L. Maury, W. D. Waugh, George W. Pugh, J. R. C. Hintz, L. F. Flanagan, A. B. Edge, Walter West, L. D. Mitchell, J. H. Neiman and R. H. Ming. Spaces 58 and 59.

DeVilbiss Company, Toledo, Ohio.—Spray painting equipment; **Type AV spray gun; portable air compressing equipment; complete spray-painting outfit.** Represented by E. G. Whitmore. Space 288.

Dickinson, Inc., Paul, Chicago.—Sheet metal and cast iron roof ventilators; stove jacks for buildings and cars; smoke jacks for engine houses. Represented by A. J. Filkins, A. E. Engman and H. Knutson. Space 98.

Dilworth, Porter & Co., Inc., Pittsburgh, Pa.—Boat, barge and railroad spikes; tie plates; special patented beam sections. Represented by John C. Dilworth and Joseph Dilworth. Space 27.

Duff Manufacturing Company, Pittsburgh, Pa.—Track jacks; lifting jacks for all purposes; **tie spacers.** Represented by C. N. Thulin, W. G. Robb, E. E. Thulin, M. L. Gibson and D. F. Evans. Spaces 35 and 36.

Edison, Inc., Thomas A., Bloomfield, N. J.—Primary and storage batteries; A. C. primary system operating color light, position light and semaphore automatic block signals and highway crossing signals of the alternate flashing light and wig wag types; semaphore signals electrically lighted by primary cells; arrangement for lighting switch lamps with primary cells; demonstration of electrically lighted crossing gate lamps; portable storage battery lights for motor cars; night repairs and general inspection; ignition batteries for track and signal departments motor cars; **75-am. hr. caustic soda cell.** Represented by L. W. McChesney, R. E. Trout, L. S. Dunham, F. S. Stallknecht, E. W. Brown, P. A. Garrity, B. F. Hines, E. W. Newcomb, W. J. Savage, J. R. Brown, R. J. Frost, C. R. Heron, O. P. Rose and A. J. Loughren. Spaces 18 and 19.

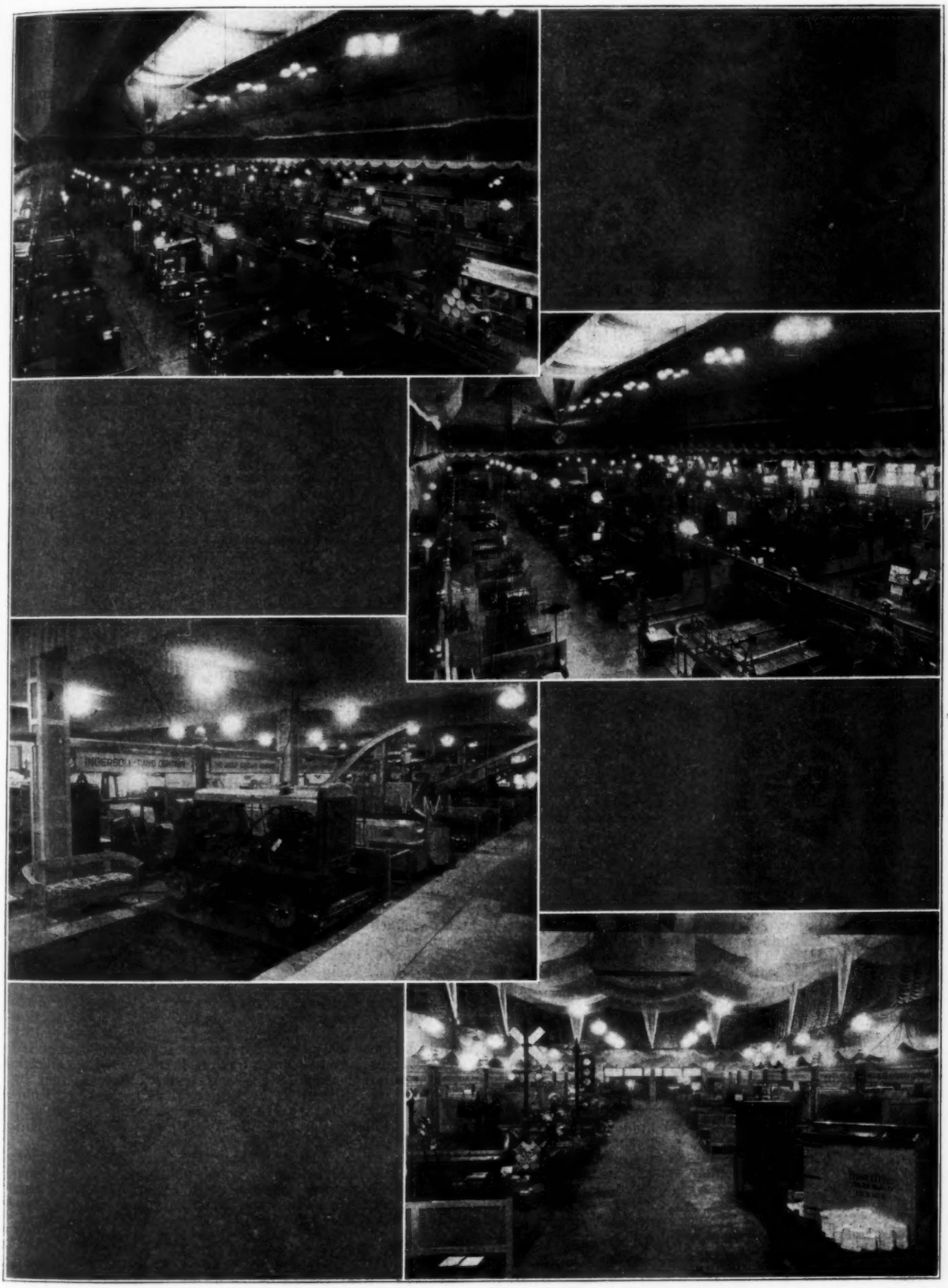
Edison Storage Battery Company, Orange, N. J.—Exhibit combined with that of Thomas A. Edison, Inc. Space 20.

Electric Railweld Service Corporation, Chicago.—**Electric welding and grinding equipment for rail end work.** Represented by H. E. McKee, M. H. Turner, B. I. Robertson, A. W. McClary and B. E. Melton. Spaces 221 and 222

Electric Storage Battery Company, Philadelphia, Pa.—Batteries for railway signal service. Represented by H. B. Crantford. Space 40.

Electric Tamper & Equipment Co., Chicago.—Electric tie tamper for rock ballast; portable electric power units; **gravel tamper.** Represented by C. Jackson, V. G. Cartier, H. W. Cutshell, Ray Cartier and M. I. McCarty. Spaces 204 and 211.

Elwell-Parker Electric Company, Chicago.—Electric crane truck for locomotive repair service; electric tractor for freight and stores department service; **electric high lift truck for shops and stores department service; 10,000-lb. capacity electric low lift truck for shops and stores depart-**



Four Views of the N. R. A. A. Exhibits at the Coliseum

ment service; 6,000-lb. capacity crane truck. Represented by G. W. Brown, L. C. Brown, George C. Isbester, A. H. Dobler and H. F. Ostrander. Spaces 200 and 215.

Engineering News-Record, New York.—Copies of publications. Represented by Williard Chevalier, A. B. Cozzens and Fred G. Hudson. Space 155.

Fairbanks, Morse & Co., Chicago.—Motor cars; trailers; standpipe; electric motors; centrifugal pumps; scale; **Price turbine pump and vertical motor drive.** Represented by P. H. Gilleland, F. M. Condit, H. L. Hilleary, C. T. Fugitt, G. Howard, L. H. Matthews, H. E. Vogel, J. L. Jones, E. P. Chase, E. J. Coverdale, R. F. Lane, C. B. O'Neil, H. J. Smith, B. S. Spaulding, E. C. Golladay, D. K. Lee, F. J. Lee, E. P. Vroome, G. W. Lewis, W. L. Nies, F. P. Drinker, J. T. Frame, W. F. Anderson, J. C. Flanagan, F. C. Snyder, C. A. Rauch and C. H. Wilson. Spaces 73, 74, 75, 76, 92, 93, 94 and 95.

Failmont Railway Motors, Inc., Fairmont, Minn.—Motor cars; motor car engines; trailers; weed mower; rail crane. Represented by H. E. Wade, W. E. Kasper, H. M. Starret, E. R. Mason and N. DeWind. Spaces 41, 42, 43 and 44.

Frog, Switch & Manufacturing Company, Carlisle, Pa.—Switch joint protector; spring rail frog of 130-lb. PS section; rail bound manganese steel frog of 130-lb. PS section; **manganese steel guard rail.** Represented by L. E. Weidman. Spaces 51½ and 52.

Giant Manufacturing Company, Council Bluffs, Iowa.—**Flood lights; pipe pushers; journal box jacks; mettalic packing.** Represented by N. E. Finch and C. R. Harding. Space 286.

General Electric Company, Schenectady, N. Y.—High and low voltage lightning arresters, expulsion and plug type cutouts; strain type choke coils; enameled tube resistors; **two complete automatic substations with automatic reclosing after an overload; cartridge fuse type primary cutout for signal line transformers; capacitors for low power factor lines; galvanized iron wire choke coil for high voltage signal power lines; 6 amp. Tungar rectifier for charging 110-volt interlocking main batteries; highway crossing unit with 10 volt lamp; snow melting unit; moving picture showing the manufacture and installation of steel ties made from scrap rails.** Represented by W. J. Hedley, B. S. Pero, F. P. Jones, F. I. Kittredge, J. J. Liles, Lynn Covey, C. Dorticos, W. G. Ferguson, R. H. Parker, E. E. Owen, G. H. Roosevelt, H. S. Woods, R. L. Hughes, John Roberts, H. M. Jacobs, C. C. Bailey, L. W. Shugg, C. T. McLoughlin, R. Y. McCullough, E. E. Kimball and H. M. Towne. Spaces 270, 271, 272 and 273.

General Railway Signal Company, Rochester, N. Y.—Style SA low voltage D.C. signal; Type K four-way neutral relay; Type F relay; Model 9A interlocking relay, A.C. two point power-off relay; A.C. one point light-out relay; **dispatching machine controlling model 5A low voltage switch layout with dual control selectors; Type K six-way neutral relay; Model 7 switch circuit controller with articulated contacts; double rail section of shoe beam length car retarder, arranged for hand operation; illuminated illustrations of all-electric car retarder installations and detail views.** Represented by F. Benedict, Paul Renshaw, J. A. Geneser, E. W. Kolb, F. W. Rizer, N. C. L. Brown, C. L. Hackett, E. C. Larry, A. C. Smith, Stanley Bryant, G. O. Hagenbach, J. C. Lindner, J. E. Stephenson, P. E. Carter, W. S. Henry, H. W. Lucia, H. B. Taylor, E. Connell, C. Henze, F. W. Moffett, L. Thomas, W. D. Cloud, A. C. Holden, A. G. Moore, A. Thomson, S. M. Day, W. K. Howe, H. P. Ober, M. C. Twitchell, Frank G. Fripp, F. L. Dodgson, S. G. Johnson, R. M. Phinney, H. C. Ware, O. S. Field, J. F. Kelly, W. W. Wenholz, S. N. Wight, J. R. Wills and J. H. Workman. Spaces 48, 49 and 50.

Griswold Safety Signal Company, Minneapolis, Minn.—**Railroad crossing signals.** Represented by F. W. Griswold and W. E. Manhard. Spaces 164½ and 165½.

Handlan-Buck Mfg. Co., St. Louis, Mo.—Flashing light signals; A. R. A. signal lamps; light bulb adapters; kerosene lanterns; electric lanterns; classification lamps; dwarf signals; marker signs; precision units; color light signals. Represented by A. H. Handlan, E. R. Handlan, A. H. Handlan, Jr., T. J. Crowley, A. J. Leonard, L. C. Kuehner, J. N. Gallagher, and P. A. Rafferty. Spaces 264 and 279.

Hayes Track Appliance Company, Richmond, Ind.—Bumping post; sliding, hinged and portable derails. Represented by Walter Boorom, E. W. Brown, Elmer P. Gibson, S. W. Hayes, Reginald K. Hoon, Thomas B. Keal, Herbert J. Mayer, Charles M. Moffitt, Sterling P. Reid, E. L. Ruby, F. C. Stowell and Vernon D. Ward. Spaces 140 and 141.

Headley Good Roads Company, Philadelphia, Pa.—Emulsified asphalt for crossings, station platforms and other railway uses. Represented by Edgar S. Ross and W. T. Gilbert. Spaces 157½, 158 and 159.

Howlett Construction Company, Moline, Ill.—Overhead hoist and model of semi-undercut gate and apron for locomotive coaling stations. Represented by W. E. Howlett, L. V. Swanson, A. E. Montgomery, James Montgomery, H. B. Adams, F. C. Luecke and G. W. McMillan. Space 250.

Hubar-Jones Corporation, New York.—**Oxygen-jet cutting machine.** Represented by Henry Hulatt and A. C. Barfield. Space 203.

Hubbard & Co., Pittsburgh, Pa.—Pole line hardware; construction specialties; railroad track tools; shovels. Represented by W. H. Remmel, Stewart Remmel, J. S. Wincrantz and R. G. Robbins. Spaces 86 and 87.

Illinois Steel Company, Chicago.—Steel wheels, car and locomotive; spikes, track; screw spikes; track bolts and nuts; tie plates; rail joints; angle bars; **floor plate section M-41.** Represented by Orren H. Baker, C. B. Friday, N. M. Hench, L. G. Hagen, J. R. McElveen, C. R. Moffatt, John Brunner, R. G. Glass, J. A. McCree, Grant Monk, S. W. Wheelock, G. G. Titzell, Jr., W. B. Weston, J. Hornbrook, W. J. Totten, A. H. Warren, D. T. Buffington, R. Korsan, Jr., and S. L. Graham. Spaces 269 and 274.

Industrial Brownhoist Corporation, Cleveland, Ohio.—Photographs of ballast-cleaning equipment and of gas operated maintenance cranes with description of operations. Represented by E. W. Taylor and L. Kleinhans. Space 249.

Ingersoll-Rand Company, New York.—Portable air compressors on railroad mountings, either hand propelled or self propelled for every class of railroad work, particularly maintenance and construction of track, bridges and buildings; tie tampers; bonding drills; rail drills; spike drivers; spike pullers; safety saw; wood borers; riveting hammers; wire brushes; grinders; **spike puller; improved motor drive for air compressor.** Represented by W. H. Armstrong, E. F. Kellehar, G. W. Morrow, T. H. Weigand, F. J. Ursem, L. A. Luther, G. E. Bridge and F. D. McDermott. Spaces 206, 207, 208 and 209.

Insulite Company, Minneapolis, Minn.—Insulation for refrigerator and passenger cars; sheeting; plaster base material; wall board for houses, stations, offices and other railway buildings; model of refrigerator car showing the use of insulation materials. Represented by L. E. Beaumont, D. D. Grassick, F. J. McNeil and E. W. Morrill. Space 261.

Jeandron, W. J., Hoboken, N. J.—**Primary battery cells of new principle.** Represented by W. J. Jeandron, H. G. Thompson, W. W. Coleman and D. B. Hughes. Space 9¾.

Jewell Electrical Instrument Company, Chicago.—Electrical indicating instruments; voltmeters; ammeters; wattmeters; volt-ammeters; special indicating devices; **headlight voltmeter; master portable voltmeters; tube checker for pliotron tubes; small high range A.C. voltmeter; car light test instrument.** Represented by E. E. Stolp, G. H. Koch, L. C. Herrmann and H. Bernreuter. Space 125.

Johns-Manville Corporation, New York.—Building materials; locomotive specialties; smoke jacks; insulating materials; packings; industrial floorings and roofings. Represented by C. S. Clingman, H. R. Poulson, C. E. Murphy, P. R. Austin, Tom O'Leary, L. S. Wilbur, G. A. Nicol, E. L. Colopy, J. C. Younglove, P. D. Mallay, H. Flannagan, J. D. Johnson and J. H. Trent. Spaces 174, 175, 176 and 177.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—No. 16L one-man inspection motor car; No. 23 section motor car; No. 25A hump motor car; No. 35 heavy duty motor car; No. 250 gear drive motor car; pressed and rolled steel wheels; wood center wheels; track drills; electric crossing gates; track gages and levels. Represented by Frank E. McAllister, R. E. Keller, L. W. Bates, P. Robischung, J. E. Murray, H. M. Clawson, L. W. Boswell, Albert C. Heath, Jr., W. S. McCallum and W. J. Hill. Spaces 8, 8½, 23, 24 and 25.

O. F. Jordan Company, East Chicago, Ind.—Spreader; composite spreader-ditcher; track oiler and spraying machine; **arrow-shaped spreader with telescoping base that supports main wings and small auxiliary side wings.** Represented by A. W. Banton, J. F. Curtis, J. C. Forbes, A. L. Greenabaum, Alfred Jones, C. H. Staples and H. W. Protzeller. Spaces 60, 61 and 62.

K. & W. Equipment Company, Chicago.—Gas-electric rail layer. Represented by A. Verne Jackson. Spaces 223, 224 and 225.

Kentucky Rock Asphalt Company, Louisville, Ky.—Paving material for grade crossings and station platforms.

Represented by W. A. Brouenfield and T. J. Foy. Spaces 156 and 157.

Kerite Insulated Wire & Cable Co., Inc., Chicago.—Insulated wire and cable. Represented by W. H. Fenley, C. A. Reeb, E. L. Reeb, E. L. Adams, M. D. Cook, C. M. Deardorff, C. E. Hiebar, E. M. Branchfield, J. P. Robinson, J. Warren Young, J. A. Renton, J. A. Hamilton and O. B. Frink. Spaces 88 and 107.

Keystone Grinder & Manufacturing Co., Pittsburgh, Pa.—Hand and power tool grinders and devices for sharpening flat drills; wood adzes; Toledo pipe dies; scythe blades; wood drills; **devices for grinding track chisels, plain bits and carpenter chisels.** Represented by L. J. Cooney and S. S. Newman. Space 117.

Kodel Radio Corporation, Cincinnati, Ohio.—**Kuprox rectifiers and charging equipment.** Represented by C. E. Ogden, J. F. Bichl, A. J. Kohn, John F. Church and W. H. Westphal. Space 181.

Koppel Industrial Car & Equipment Co., Koppel, Pa.—Photographs of air dump cars. Represented by H. W. Redman, W. W. Stewart and O. E. Kantenwein. Space 285.

Krupp Pneumatic Tie Tamping Outfit, Chicago.—**Pneumatic tie tamping outfit.** Represented by Johann Bieren. Space 145.

Layne & Bowler Manufacturing Co., Memphis, Tenn.—Shutter screen; top drive pump head; gravel wall well. Represented by T. H. Buckley. Space 89½.

Lebanon Steel Foundry, Lebanon, Pa.—Steel frangeway guard; **adjustable guard rail clamp.** Represented by W. H. Worrilow, P. E. Gerhard and A. J. McDonald. Space 116.

E. A. Lundy Company, Pittsburgh, Pa.—Arc welder; signal bond wires; fire-retarding paint; highway crossing signals; circuit controller; rail expanders; signal rectifiers; reinforced switch products; relays; signal power units; twin grip wire connectors; wire clamp; electric switch lamp. Represented by C. G. McCaulley, A. J. Wilson, C. F. Hopkins, P. B. Hyde, A. R. Whitehorn, R. H. Ewing, R. B. Arnold and E. A. Lundy. Spaces 238, 239, 240 and 241.

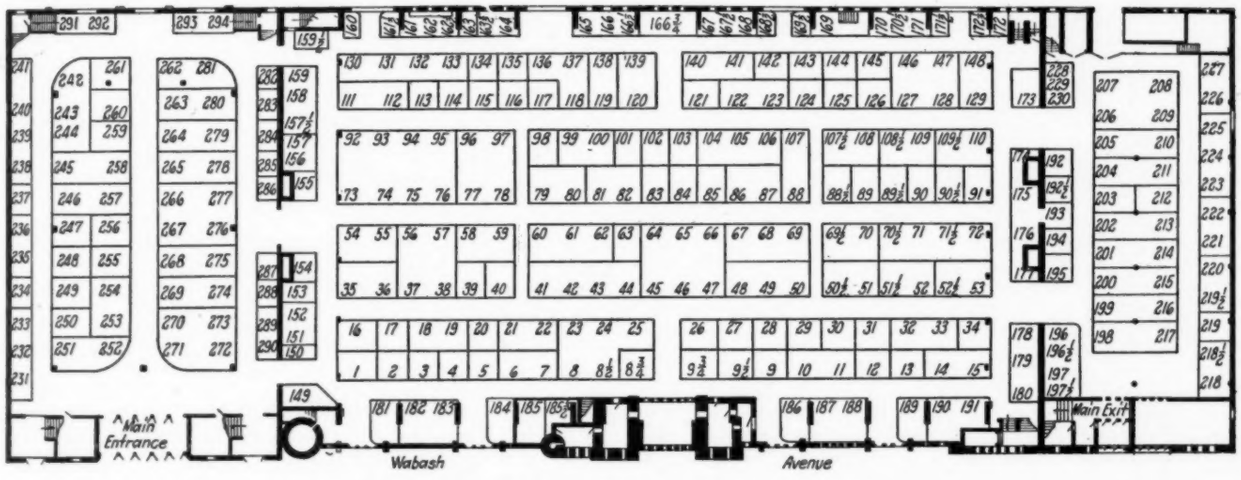
MacLean-Fogg Lock Nut Company, Chicago.—Lock nuts Nos. 1, 2 and 3; unit nuts; speed nuts. Represented by J. A. MacLean, J. W. Fogg, C. Beaumont and J. A. MacLean, Jr. Space 1.

MacRae's Blue Book Company, Chicago.—MacRae's and Hendricks Commercial Blue Books. Represented by E. E. Jones, L. Simonson, D. Ilette, C. Hill, F. O. Rice, W. P. Dent, Alex Smith, E. S. Wallace and R. S. Jaquith. Space 287.

Magnetic Signal Company, Los Angeles, Cal.—Wig-wag crossing protection signal with auxiliary out-of-order indication; rail joint expander; **rail inspector.** Represented by T. E. Akers, Laurence Boswell, R. J. Davidson, Ralph W. Payne, H. W. Renick and J. V. Westcott. Space 3.

Maintenance Equipment Company, Chicago.—Friction car stop; automatic rail and flange lubricator; **reversible switch point protector; power track ballaster;** literature on three-man rail layer and steel fence post. Represented by H. C. Holloway, H. L. Dommersnaes, J. A. Roche, J. M. Fairbairn, E. Overmier and A. L. Arnold. Space 118, 136 and 137.

Malleable Screw Products Company, Inc., Cincinnati,



Floor Plan of the Exhibit Space at the Coliseum, Chicago

Tehon Company, Chicago.—Asphalt roofing; canvas car roofing; insulating paper; waterproofing compound; waterproofing fabric; asphalt paints; asphalt floorings; **asphalt shingles.** Represented by Tom Lehon, J. W. Shoop, J. E. Eipper, Harry A. Wolfe and Fred A. Locke. Space 91.

Light Inspection Car Works, Hagerstown, Ind.—**Motor car.** Represented by B. F. Teetor. Space 166¾.

Locomotive Finished Material Company, Atchison, Kan.—Permanent highway crossing. Represented by Clive Hastings and R. L. McIntosh. Space 103.

Lorain Steel Company, Johnstown, Pa.—Frog and switch material. Represented by C. Burton, S. P. McGough, S. J. Cotsworth, T. W. Brush, Otto Fischer, W. W. Kingston, T. G. Vanca, H. L. Gleason, J. S. Dwyer, J. W. Stanley, C. R. Boscher and J. A. McHugh. Spaces 266, 267, 276 and 277.

Louisville Frog and Switch Company, Louisville, Ky.—Reinforced tubular bottom crossings; all steel bumping posts; gage rods; self-guarded frogs; switch point guards. Represented by F. W. Carter, J. S. Drillette, E. A. Mann, C. W. Stevens, and L. R. Payton. Spaces 263 and 280.

Lufkin Rule Company, Saginaw, Mich.—Measuring tapes; rules; machinists tools; **stainless steel tapes; heavy engineers tapes.** Represented by S. A. McConnell, R. M. Benjamin and T. P. Young. Space 121.

Lundie Engineering Corporation, New York.—Tie plates; **improved tie plates.** Represented by John Lundie, Eugene Brandeis, L. B. Armstrong, George W. Nibbe, R. L. Nutt, Jr., Charles W. Stone and W. H. Allen. Space 90½.

Ohio.—Self-boring screw spikes and self-boring lag screws together with driving devices. Represented by E. J. Correll, Arthur S. Bland, Verne Coates, Albert C. Heath, Jr., and E. C. Holms. Space 192½.

Massey Concrete Products Corporation, Chicago.—Concrete cribbing; battery boxes; culvert pipe; **precast passage way for passenger station tunnels.** Represented by Charles Gilman, David A. Hultgren, W. L. McDaniel, J. A. Hicks, Jr. and C. H. Hunsaker. Spaces 54 and 55.

Mechanical Manufacturing Company, Chicago.—Bumping posts; continuous-rail switch frog; combination guard rail and clamp. Represented by H. E. Johnson and J. S. Banks. Spaces 245 and 258.

Metalweld, Inc., Philadelphia, Pa.—Rail-car portable air compressors; **four-tamper, 110 cu. ft. capacity air compressor; twelve-tamper, 280 cu. ft. capacity air compressor.** Represented by C. F. Oechsle, J. S. Oeschsle, W. Vinnedge, Gilmore Wooler and Albert Watson. Space 212.

Metal & Thermit Corporation, New York.—Railwelding equipment; material samples of welded rail and locomotive frame sections; **gasoline driven rail welding preheater.** Represented by W. R. Hulbert, J. B. Tinnon, W. O. Aldrich, C. D. Young and A. H. Lindros. Spaces 198 and 217.

Morden Frog & Crossing Works, Chicago.—Solid manganese self-guarded frog; built up self-guarded frog; manganese guard rail; adjustable brace; switch point clips; switch fixtures; **universal foot guard.** Represented by George F. Kilmer, B. T. Gibbs, Jr., Sam Withrow, J. M. Karcher, W. J. Gilbert, R. A. Brown and W. Homer Hartz.

Spaces 69½ and 70.

J. W. Mortell Company, Chicago.—**Preservative coating for steel, wood, brick and cork.** Represented by J. W. Mortell, Jr., E. E. Mortell, Jackson MacLow and D. A. Bonitz. Space 282.

Mudge & Co., Chicago.—Motor cars; push cars; trailers; accessories; **class WS9 section motor car; combination push car and trailer.** Represented by Robert D. Sinclair, Albert C. Force, Clyde P. Benning, Arthur R. Fletcher, John G. Abplanalp, Ralph W. Payne, W. D. Achuff, Achilles P. Grenier, Thomas J. Crowley, James C. Barr, V. Pagett, Fred C. Whitehouse and Leon B. Ryan. Spaces 127, 128, 146 and 147.

Murdock Manufacturing & Supply Co., Cincinnati, Ohio.—Water service box; air box; quick opening and closing valve; drinking fountains; hydrants. Represented by J. C. Endebrock. Space 134.

National Boiler Washing Company of Illinois, Chicago.—Represented by Spencer Otis, Frederick A. Gale, Fred W. Gale and Guy L. Lloyd. Space 12.

National Carbon Company, Inc., New York.—Signal cells; dry cells and hot shot batteries; flashlights and flashlight batteries; carbon products. Represented by W. H. Haile, J. M. Spangler, D. H. Green, M. D. Reese, L. R. Griffin, P. G. Pendorf, J. S. Gemmel, J. L. Green, H. H. Beck and J. A. Robinson. Space 9.

National Lead Company, New York.—Red lead; solder; babbitt; **giant reproduction of red lead keg.** Represented by F. M. Hartley, Jr., F. E. Dodge, W. S. Carlisle, C. L. Haas and A. H. Sabin. Spaces 187 and 188.

National Lock Washer Company, Newark, N. J.—Improved spring washers. Represented by G. L. R. Masters, W. R. Hillary, F. B. Archibald, R. L. Cairncross, A. T. Hyatt, S. H. Smith and W. H. Reaves. Space 114.

National Safety Appliance Company, Chicago.—Signal relays; signal accessories; automatic train control; **polar relays.** Represented by Ed. C. Wilson, J. C. Anderson, E. W. Stone and C. E. Sampson. Space 149.

National Vulcanized Fibre Company, Wilmington, Del.—Fibre for rail joint; steel tie; bridge insulation; insulation specialties; laminated bakelite. Represented by J. Warren Marshall, J. K. Johnston, H. C. Hackett, C. C. Bell, A. J. Cox, G. W. Glaescher and John Barron. Space 126.

Nelson Manufacturing Company, B. F., Minneapolis, Minn.—Asphalt roofing and shingles; car roofing; membranes; insulation. Represented by E. H. Batchelder, Jr. and K. T. Batchelder. Space 13.

Nichols & Bros., Geo. P., Chicago.—Two-wheel turntable tractor; duplex control for double tractor installations. Represented by S. F. Nichols, H. E. Notley, N. Fries and G. M. Shearer. Space 173.

Nordberg Manufacturing Company, Milwaukee, Wis.—Track machines, one arranged for shifting track and the other equipped with leveling device for raising track vertically; **full-revolving crane for rail relaying.** Represented by H. H. Talboys, Delbert Kay, Victor F. Larson, W. Boudreau and W. W. Fitzpatrick. Spaces 201 and 214.

Northwest Engineering Co., Chicago.—Photographs and moving pictures showing adaptation of shovels, cranes and draglines to railroad work. Represented by Wm. S. Miller, G. C. Williams, and Paul Cochrane. Space 185.

Northwestern Motor Company, Eau Claire, Wis.—Heavy duty motor car; safety first inspection car; **ballast discer; heavy duty section car; ball bearing engine.** Represented by F. W. Anderson, A. H. Nelson, R. R. Rosholt, O. B. Duncan, W. B. Jeffress, G. H. Goodell, W. J. Roehl, Tom C. King, A. L. Datesman, J. H. Perry, Jr., W. H. Allen and W. Newton Jeffress. Spaces 196, 196½, 197 and 197¼.

Ogle Construction Company, Chicago.—**Model of ash handling plant.** Represented by L. G. Plant, William Snell and J. G. Forster. Space 31.

Ohio Brass Company, Mansfield, Ohio.—Porcelain insulators; catenary fittings; propulsion bonds; gas applied signal bonds. Represented by J. R. Palmer, J. H. Drew, Marshall McCormick, O. M. Hullinger, F. E. Seeburger, J. B. Weigel, W. P. Bovard, P. P. Pipes, D. A. Moore and F. E. Johnson. Spaces 253 and 254.

Ohio Valley Rock Asphalt Co., Inc., Louisville, Ky.—Models of rock asphalt highway crossings and station platforms. Represented by S. O. LeSueur, E. F. Heil, J. B. Wilson, George W. Rapp, and H. S. Marshall. Space 150.

Okonite-Callender Cable Company, Inc., Passaic, N. J.—Signal wires and cables; power cables; train control wire; friction tapes; splicing compound. Represented by Charles E. Brown, J. W. Hackett, Elbridge McNeil, Frank J. White, H. A. Hamilton, Lee Mann, J. D. Underhill, J. J. O'Brien A. L. McNeil, Percy W. Miller, and W. R. Van Steenburgh. Space 17.

Okonite Company, Passaic, N. J.—Signal wire and cables; power cables, train control wire; friction tapes; splicing compound. Represented by Charles E. Brown, J. W. Hackett, Frank J. White, H. A. Hamilton, J. D. Underhill, J. J. O'Brien, Elbridge McNeil, Percy W. Miller, A. L. McNeil, Lee Mann and W. R. Van. Space 16.

Oxweld Railroad Service Company, Chicago.—Reception booth. Represented by R. R. Browning, C. B. Moore, M. C. Beymer, E. S. Richardson, F. H. Haggerson, G. B. Walker, F. C. Hasse, G. P. Bogert, H. X. Gigandet, W. Leighton, J. G. Tawse, H. W. Schulze, W. Jones, W. A. Hogan, A. N. Lucas, G. M. Crownover, C. S. Wright and L. C. Ryan. Spaces 10 and 11.

Paasche Airbrush Co., Chicago.—Two-man gasoline railroad spray-painting unit. Represented by Mr. Dagon and Mr. Hurlbut. Space 283.

Page Steel & Wire Co., Bridgeport, Conn.—Signal bonds; welding wires; highway guard; woven wire fence. Represented by W. T. Kyle and E. J. Flood. Space 83.

P. & M. Company, Chicago.—Rail anti-creepers; bond wire protectors. Represented by F. A. Preston, F. N. Baylies, D. T. Hallberg, G. E. Johnson, J. M. Fairbairn, S. M. Clancey, J. J. Gallagher, C. H. Norwood, J. E. Mahoney, G. E. Olson, G. E. Webster, M. K. Ruppert, E. J. Van Patten, W. A. Maxwell, W. H. Reaves, T. J. Byrne, P. H. Hamilton, L. S. Walker and W. G. Cunningham. Spaces 119 and 138.

Parsons Company, Newton, Iowa.—Light rail-laying crane equipped with clamshell bucket, air compressor and electric generator. Represented by G. A. Vaughn, W. N. Keiser, W. F. Kasper and J. G. Telfer. Spaces 202 and 213.

Pettibone Mulliken Company, Chicago.—Flange frog; insert frog; switch stand; **switch connected to buffer cylinder; switch point lock.** Represented by G. J. Slibeck, A. Swartz, L. Martin, C. Johnson, Duke O. Sweddon and T. Nash. Spaces 242, 243 and 244.

Pocket List of Railroad Officials, New York.—Copies of publication. Represented by J. Alexander Brown, Harold A. Brown and B. J. Wilson. Space 26.

Positive Rail Anchor Company, Chicago.—Rail anchors, guard rail braces; rail braces; guard rail braces; plates; guard rail chairs. Represented by A. H. Told, L. C. Ferguson and J. Shoulty. Spaces 178, 179 and 180.

Pyle-National Company, Chicago.—Train control turbogenerators; headlight cases; floodlights; locomotive and shop wiring appliances; **Type MRL dual voltage turbogenerator.** Represented by J. Will Johnson, J. A. Amos, W. Miller, J. V. Baker, Frank Currie, E. H. Hagensick, J. J. Kennedy and T. E. McDowell. Spaces 37, 38, 56 and 57.

Q. & C. Company, New York.—Guard rail clamps; guard rails; joints; insulated joints; fence posts; switch point guards; rail braces; **self-adjusting, sliding derail.** Represented by F. F. Kister, E. R. Packer, J. L. Terry, E. M. Smith, R. G. McComb, L. T. Burwell, H. T. Henry and Louis Thomas. Spaces 120 and 139.

Rail Joint Company, Chicago.—Standard joints; insulated joints; compromise joint; track liner. Represented by V. C. Armstrong, J. C. Barr, E. Bishop, Alex Chapman, George Clodfelter, C. A. Disbrow, J. D. Delfox, W. E. Gadd, C. B. Griffin, J. A. Greer, A. C. Hickey, C. Jenkinson, G. H. Larson, M. Markley, J. G. Miller, W. C. Motter, J. H. Larmonth, R. W. Payne, J. N. Meade, Thomas Ryan, R. W. Seward, E. F. Schermerhorn, W. P. Thomson, McLeod Thomson, L. D. Whittaker and D. P. Wolhaupter. Spaces 79 and 80.

Railroad Accessories Corporation, New York.—Power M-W track drill; power bonding drill; lightning arresters; Parkway outlets; deadends; cut-out number plates; **bracket lamp; bootleg; trunking risers; R A bonds; line taps.** Represented by F. C. Lavarack, E. M. Deems, B. A. Lundy, Shirley G. Ellis and W. G. Burns. Space 14 and 15.

Railroad Herald, Atlanta, Ga.—Reception booth; copies of publication. Represented by E. C. Laird. Space 172.

Railroad Supply Company, Chicago.—Highway crossing protection devices; signaling accessories; tie plates; specialties. Represented by E. H. Bell, R. E. Bell, H. M. Buck, W. S. Boyce, Theo. H. Cole, J. C. Duranceau, M. J. Fox, R. D. Hawley, John Hensel, F. M. Hill, Paul W. Kohnen, Samuel Miskelly, A. C. Reid, A. H. Smith, Arthur H. Smith and G. T. Willard. Spaces 104, 105 and 106.

Railway Maintenance Corporation, Pittsburgh, Pa.—Ballast cleaning machine; ballast cleaning mole. Represented by J. B. McWilliams, John F. Casey, Jr. and L. A. Merk. Spaces 262 and 281.

Railway Purchases and Stores, Chicago.—Copies of publication. Represented by Edward Wray, H. B. Kirkland, J. P. Murphy and K. F. Shuran. Space 154.

Ramapo Ajax Corporation, New York.—Swith point with accessories; mangnese switch with adjustable clips; manganese flange switch guard; manganese one-piece guard rail; rail expander; crossing; automatic safety switch stands; gearless switch stands; high switch stand; guard rail clamp; adjustable and drop forged rail braces; adjustable open side clips; double shoulder switch plate; oil cylinder dash pot; rail inspector; switch locking device; non-derailer. Represented by T. E. Akers, W. Bender, G. A. Carlson, G. M. Cooper, J. V. Cowling, S. Dolan, D. Fairback, W. J. Fairback, R. W. Payne, W. A. Peddle, H. W. Renwick, J. B. Strong, J. E. Davidson, D. F. Hilton, J. V. Houston and P. Hoffman. Spaces 109½ and 110.

Rawls Manufacturing Company, Streator, Ill.—**Heavy duty mower with gasoline engine for propelling sickles only, operated from rails or track; motor mower type J with gasoline engine for sickle and traction power, not operated from rails or track.** Represented by S. E. Rawls, J. C. Kopf, E. R. Paulson, J. Kranz, C. F. Butts and N. H. Greer. Spaces 226 and 227.

Reade Manufacturing Company, Jersey City, N. J.—Quarter size working model of spray car for applying chemical weedkiller; **model showing equipment for spraying two and three tracks.** Represented by Charles H. Reade, D. M. DeWitt and Kenneth Danielson. Space 256.

Reed-Prentice Corporation, Worcester, Mass.—Portable timber sawing machine. Represented by F. W. McIntyre, B. A. Brown and Fred H. Jones. Space 284.

Reliance Manufacturing Company, Massillon, Ohio.—Spring washers. Represented by H. J. McGinn, R. L. Thireman, E. D. Cowlin and A. C. Rule. Space 135.

Richards-Wilcox Manufacturing Company, Aurora, Ill.—Slidetite industrial door hardware for roundhouse and machine shop openings with milltype doors; parallel door hardware for freight sheds; ball bearing I-beam trolleys; bi-folding door hardware; door checks; milltype door No. 448. Represented by A. J. LaFleur, E. J. G. Phillips, J. H. Wise, A. J. Eggleston, W. Guay, C. Riemenschneider, A. W. Thurow and C. Phillips. Space 170, 170½ and 171.

Roberts and Schaefer Company, Chicago.—**Full size locomotive electric hoist for coaling station in operation; operating model of multiple-pit electric cinder plant; enlarged photographs of completed locomotive coaling stations, cinder handling plants and operating equipment.** Represented by Clyde P. Ross, David E. White, Charles Corwin and G. O. Morford. Space 34.

Roberts Company, George J., Dayton, Ohio.—Complete railroad water treating plant; wayside treating plant; wayside treating plant complete. Represented by John C. Jamieson and Henry F. Ostendorf. Spaces 161, 162 and 162½.

Robertson & Co., Wm., Chicago.—Cinder conveyor; culvert. Represented by W. Robertson, K. Robertson and R. F. Repasz. Space 184.

Robertson Co., H. H., Pittsburgh, Pa.—Protected metal roofing and siding sheets; skylights; sash; ventilators; sidewall sash. Represented by J. R. Sevton, F. C. Russell, E. I. Wasmuth, and A. R. Gray. Spaces 246 and 257.

Rosebrook Manufacturing Company, Chicago.—**Rail joint for track scales.** Represented by H. H. Rosebrook and W. I. Moon. Space 172½.

Sears, Roebuck & Company, Chicago.—Track shovels; tool houses; foremen's homes; sectional railway buildings; models of buildings. Represented by W. L. Lane, C. L. Butts and H. Dilliam. Spaces 219½ and 220.

Simmons-Boardman Publishing Company, New York.—Copies of Railway Age; Railway Engineering and Maintenance; Railway Signaling; Railway Mechanical Engineer; Railway Electrical Engineer; Boiler Maker; Marine Engineering and Shipping Age; Railway Engineering and Maintenance Cyclopedia; books. Represented by L. B. Sherman, George Slate, F. C. Koch, J. G. Little, H. A. Morrison, J. M. Rutherford, R. F. Duysters, H. E. McCandless, Samuel O. Dunn, E. T. Howson, W. S. Lacher, J. H. Dunn, D. A. Steel, J. C. Emery, W. F. Rench, F. M. Patterson, N. D. Howard, R. S. Kenrick, Chas. Layng and R. W. Beckman. Space 84.

Sellers Manufacturing Company, Chicago.—Anchor bottom wrought iron tie plates; arched bottom wrought iron tie plates; anchor bottom wrought iron guard rail tie plates. Represented by J. M. Sellers, R. J. Platt, R. A. Van Houten, S. H. Smith, G. M. Hogan, A. F. McCoole and F. J. Reagan. Space 124.

Signal Accessories Corporation, Utica, N. Y.—Switch adjusters; latch lever locks; signal blades; rail braces foundation extensions; switch boxes; crossing light signals; roundel protectors; pipe carrier supports bootleg terminals; flashing relays; **solderless bootleg terminal; pothead; circuit controllers for interlocking machines; flashing relay.** Represented by W. R. Burke and Mark R. Briney. Space 113.

Sining Track Liner Company, Ramsey, Ill.—Special track liner; improved track liner; **rail joint adjuster.** Represented by Frank R. Sinning, Frank J. Reagan, Stanley H. Smith, R. B. Hill and John T. Reagan. Space 169½.

Sivyer Steel Casting Co., Milwaukee, Wis.—Steel castings for railroad specialties. Represented by Arthur H. Oberndorfer, Lawrence Hahn, Paul Thessin and Martin A. Fladoes. Space 234.

Skelton Shovel Company, Inc., St. Louis, Mo.—Track shovels; spades. Represented by H. C. Branahl, E. W. McCarty, G. L. McKewin and C. A. Trigg. Space 9½.

Snap-on Wrench Company, Chicago.—Wrenches; tools. Represented by C. H. Tennyson and C. W. Edwards. Space 143.

Snow Construction Company, T. W., Chicago.—Inlet and outlet tank fixtures; free style penstock valves; **side clearance telltales.** Represented by J. M. Freeling, B. J. Hastings, A. B. Hodgson, W. A. Lathrop, V. L. Lyle, W. H. Mayor, B. S. Snow, O. T. Snow and V. L. Walker. Spaces 107½ and 108.

Southern Signal Corporation, Louisville, Ky.—Highway crossing flashing light signals; parkway outlets; cable terminal boxes; cable poles; signal numbers; safe lock switch machines; lighting relays; flashing relays; flashing time relays; neutral relays; interlocking relays; signal bells; rail contactors; traffic signal controls; **interlocking relay; neutral relay; flashers; traffic signal control.** Represented by F. W. Carter, J. E. Clough, J. E. Butler, L. R. Zehnder, E. A. Mann, L. R. Payton and C. W. Stevens. Spaces 293 and 294.

Standard Automatic Signal Corporation, Chicago.—**Automatic signals and gates.** Represented by Edward H. Taylor, Duncan L. Clinch, O. L. Vincent, W. C. Warren and Thomas F. Mulvey. Spaces 291 and 292.

Standard Oil Company of Indiana, Chicago.—Miscellaneous display of asphalt products; **liquid asphalt for paving and roofing work and wood preservation.** Represented by E. F. Tegtmeyer, F. P. Keane, W. A. Jones, A. T. Hague, M. E. Brown and W. H. Meyers. Space 2.

Syntron Company, Pittsburgh, Pa.—Electric tie tampers; rail wrenches; arc welders; rail saws; wood saws; **gas-electric power car; rail layer; nut tightener; spike driver.** Represented by C. S. Weyandt, E. D. Jackson, D. G. Black, E. J. Missien and G. A. McKee. Spaces 199 and 216.

Templeton, Kenly & Co., Ltd., Chicago.—Track jacks; automatic jacks; screw jack; track adjuster; tie saver; pipe pusher. Represented by James L. Crowley, Joseph Dolar, George L. Mayer, C. A. Crane, Jr., W. H. Kreer, William Simpson and W. B. Templeton. Spaces 32 and 33.

Torchweld Equipment Company, Chicago.—Gas welding and cutting apparatus; **cutting torches; welding torch; welding and cutting regulators.** Represented by W. A. Slack, C. F. Egbert, Russel Smith, J. L. Jensen, R. C. Gutke and C. L. Thompson. Space 5.

Union Switch & Signal Company, Swissvale, Pa.—Union dispatcher controlled signaling system with miniature track layout equipped with miniature style R-2 color light signals and automatic train graph; Style R-2 color-light, position-light, search light, and color-position-light dwarf signals; Style DN-10, Model 13, Model 12 interlocking and Style N. F. flasher relays; Model 15 vane, Style SLV-13 vane, Style SV-30 slow acting vane, Style TV-30 vane, Style ANL-20 and Style ANL-10 alternating current relays; Style RT-10 track and line and Style RX-10 track and line rectifiers; Style RP-10 rectifier for heavy duty 12-volt batteries; small rectifiers for special applications; Style T-10 hand operated switch mechanism; **dual control Style M-2 switch and lock movement; dispatcher control board; Style HC-5 color-light highway crossing signal; DN-11 relay; RT-22 rectifier for charging remotely controlled switch batteries; RP-20 rectifier for 110-volt batteries; various small rectifiers; terminal and junction boxes; improved bootleg.** Represented by W. P. Allen, B. T. Anderson, C. D. Baker, H. S. Beakes, E. S. Berry, G. A. Blackmore, W. H. Cadwallader, R. Clayburn, J. P. Coleman, J. J. Cozzens, A. Dean, A. W. Fisher, S. E. Gillespie, W. J. Gillingham, M. L. Gray, H. W. Griffin, C. G. Harwig, J. S. Hobson, W. H. Horsch, L. F. Howard, Kenneth M. Hughes, K. E. Kellenberger, J. L. Loucks, J. T. Mallanny, G. Marloff, J. E. McCaulley, H. McCready, J. K. Mickley, T. J.

Mickley, T. J. O'Meara, W. B. Rudd, H. R. Sheene, P. P Stoker, J. F. Talbert, W. W. Talbert, S. J. Tureff, A. L. Vencill, E. A. Warner, C. M. Wheeler and J. H. Young. Spaces 67, 68 and 69.

U. S. Wind Engine & Pump Co., Batavia, Ill.—Tank material and fixtures; model tank and structure for water station; water column and valves; tank, float and outlet valves; quick cleaning strainer foot valve; platform pump; switchstand; semaphore; tank stuffing box; model tank and tower for stockyards or small supply; model of bath-in-oil windmill with tower; **chemical pump for water treating plant; water service box.** Represented by L. E. Wolcott, C. E. Ward, G. E. Vermilyer, T. S. Daniels and J. P. Prindle. Spaces 111 and 112.

Universal Generator Company, Blossburg, Pa.—Flood lights; **soldering outfit.** Represented by F. E. Mull and B. W. Leonard. Space 161½.

Verona Tool Works, Pittsburgh, Pa.—Rail joint spring; rail anchor; track tools; wrenches. Represented by W. F. Schleiter, W. W. Glosser and B. M. Cheney. Space 195.

Warren Tool & Forge Co., Warren, Ohio.—Track tools; track levels. Represented by Howard Mull, William S. Konold, Joseph F. Leonard and E. L. Ruby. Space 29.

Waterbury Battery Company, Waterbury, Conn.—Signal batteries in various sizes from telecell of 75 amp. hr. capacity to unit cylinder cell of 1000 amp. hr. capacity; ARA battery renewals; **battery boxes for RFT cells; telecell.** Represented by S. J. Hough, G. S. Gaunt, G. A. Nelson and M. L. Martus. Space 39.

Weir, Kilby Corporation, Cincinnati, Ohio.—Manganese insert frog; switch stands; guard rail clamp. Represented by O. De G. Vanderbilt, Jr., E. M. Kilby, H. G. Barclay, J. K. Lansdowne, C. E. Hogan and H. N. West. Space 30.

Western Wheeled Scraper Company, Aurora, Ill.—Models and moving pictures of lift door dump car with extension apron and **dual pivot drop door dump car.** Represented by J. E. Huber and Jess Mosgrove. Space 63.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.—Lightning arresters; choke coil; disconnect switch; floodlights; industrial and interior lighting; frequency changer; portable electric instruments; **the osisc and oscillagraph by which the human voice can be seen.** Represented by E. W. Beck, C. E. Harris, W. J. Healey, C. F. King, A. B. McKelvey, J. J. Monroe, A. L. Scnieber, A. P. Schrader, K. A. Simmon, P. F. Squier, L. C. Simpson, T. W. Merrill, C. W. Regester, R. H. Kilner, Mr. Spangler, Mr. Brooks, Mr. Grant, Mr. Jacobs and Mr. Gordon. Spaces 21 and 22.

Weston Electrical Instrument Company, Newark, N. J.—Electrical indicating instrument for railway and signal and general electrical testing; **small tachometer.** Represented by Paul A. Westburg, Alvin Thielke, Kline Gray and James F. Inman. Space 237.

Wharton Jr. & Co., Inc., Wm., Easton, Pa.—Self-guarded frog No. 8; 105 lb. Dudley section; O'Brien rod; one-piece manganese guard rail; **solid manganese steel half-crossing.** Represented by H. F. McDermott, B. M. Judson, Charles M. Griffith, R. C. McCloy, J. R. Smith and Charles N. Schaffner. Spaces 52½ and 53.

Wilson Welder & Metals Co., Hoboken, N. J.—Gasoline engine drive on welder; electric motor drive arc welder. Represented by Joseph T. Ryerson & Son, Inc., T. W. Delanty, J. B. Whitenack and R. A. Davidson. Space 194.

Wood Conversion Company, Chicago.—Working model illustrating the distortion of freight car in motion; refrigerator and passenger car insulation. Represented by D. H. Corlette, A. H. Purdom and F. C. Vanderwort, Jr. Space 219.

Woodings Forge & Tool Co., Verona, Pa.—**Track tools; rail anchors.** Represented by E. Woodings, C. L. Woodings and R. T. Woodings. Space 171½.

Woolery Machine Company, Minneapolis, Minn.—Gasoline engines; motor cars; **tie scorer; rail joint oiler.** Represented by H. A. Rogers, C. E. Berg, J. T. Stephenson, L. C. Sparks, D. A. Woolery and H. E. Woolery. Spaces 231, 232 and 233.

Wyoming Shovel Works, Wyoming, Pa.—Shovels and scoops for railroad use; **welded shovel; track shovel with step integral with blade.** Represented by H. T. Potter, Stanley H. Smith, M. S. Hendrickson, E. L. Ruby, C. S. Jordan and S. F. Cobb. Space 101.

Zenith Shovel Company, Chicago.—**Track shovels.** Represented by George McQuade and W. H. True. Space 153.

N. R. A. A. Elects Officers

A. L. GREENABAUM, vice-president of the O. F. Jordan Company, East Chicago, Ind., was elected president of the National Railway Appliances Association at the annual meeting held in the dining-room of the Coliseum yesterday morning. The other officers elected were: Vice-president, S. P. McGough, Lorain Steel Company, Johnstown, Pa., and secretary-treasurer, C. W. Kelly (re-elected). The directors elected were: M. C. Beymer, Oxweld Railroad Service Company, Chicago (one year to fill the unexpired term of S. P. McGough); W. H. Fenley, Kerite Insulated Wire & Cable Company, New York (two years to fill the unexpired term of B. L. Winchell, Jr.); J. T. McGarry, American Valve & Meter Company, Cincinnati, Ohio (three years); and H. F. McDermott, Wm. Wharton, Jr., & Co., Inc., Chicago (three years). The election comprised an unanimous approval of nominations submitted by a committee consisting of W. B. Murray, Miller Train Control Corporation; A. J. Filkins, Paul Dickinson Company; and E. H. Bell, Railroad Supply Company.

Evidence of the sound financial condition of the association was shown in the report of Secretary-Treasurer Kelly, who stated that the estimated balance of income over expenses for the exhibit now in progress would be between $1,500 and $2,000. This is to be compared with a net gain of $2,159.32 for the year of 1926-27 and a deficit of $6,981.17 for the year 1925-26. He explained that the favorable results for the present year are to be explained in part by a rearrangement of the exhibit space which made it possible to provide five additional booths. He commended the exhibitors for their co-operation in making preparations for the exhibit. By complying with his request to send their exhibit materials in early it was possible to handle deliveries and installations with a minimum of confusion. By way of illustrating the good work of the exhibitors he said that 19 carloads of freight for the exhibit were either in the warehouse or on tracks a week before the show.

President L. E. Weidman, vice-president, Frog, Switch and Manufacturing Company, Carlisle, Pa., opened the meeting with some pointed comments on the objects of the association and the success which has attended the efforts of the members since its organization.

Remarks of President Weidman

"After serving on this board for a number of years and realizing through this experience how largely our secretary is responsible for the success of our exhibits, it occurs to me that we might add to his duties the job that is now assigned to me. To be the president of this association is not an unpleasant task so I would like to mention a few things that have occurred to me during my administration.

"It is usual to comment on the effect of the show in contrast with that of other shows and whatever may be the opinion as to the beauty and character of the show this year I believe this exhibition will always show improvement from year to year, because the materials exhibited are forever being improved by the manufacturers to whose interest it is to have this show which is essentially an exhibit of railroad materials.

"We sometimes feel that the cost of conducting

exhibits is excessive, but because we know our money is wisely spent and because we realize the vast amount of work done here in a few days, I am sure we think more of the results obtained than we do of the cost. It must be obvious to all of us that because we were founded a long time ago is poor evidence of our present success, but I believe that we are progressing and that our shows are better each year, for otherwise we would have to admit that we exist today largely because of momentum accumulated in the past. Our existence is not due to sentiment. Instead, the object in giving this exhibition is to do our part in the advancement of the art of railway construction and maintenance.

"The associations whose members are in Chicago at this time are dependent very largely on each other for their continued success because of their mutual interests. The members of the associations with whom we meet during this exhibition are men who share a great deal of the responsibility for the successful operation of the greatest system of railroads in the world. Their efforts, I take it, are largely technical and we try to translate their efforts into mechanical devices and show them here in this exhibit how successful we have been.

"My connection as an officer of this association will soon be at an end. To me, this thought is not pleasant but it reminds me of another association that is holding many meetings in Chicago at this time and of which I hope always to be a member. It is not formal and there are no officers or directors, for its members are customers and competitors who are bound together in friendship that will survive any formal association because it is the foundation of all associations of men.

"Let us remember that we are big and that we are co-operating with the representatives of a transportation industry that has a very definite purpose in having these men here. The organizations back of us are also among the greatest enterprises in the world and I hope we may never be unmindful of these things in whatever undertaking this association may engage or in whatever we may do as individuals."

A. L. Greenabaum, President-elect

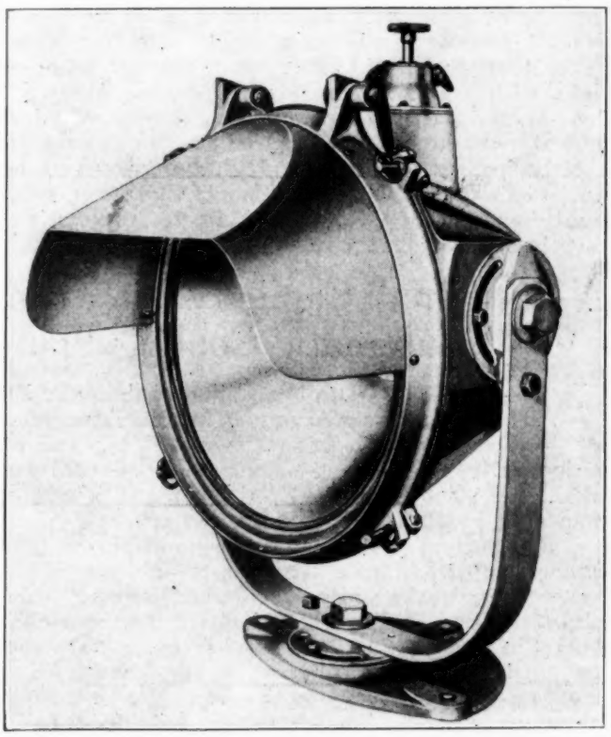
The election of A. L. Greenabaum to the presidency of the National Railway Appliances Association is the second recognition which he has received within a few weeks time, for he was but recently made vice-president of the O. F. Jordan Company, with which he has been associated for the past eight years. Like many other leaders in the railway supply industry "Al" Greenabaum served an apprenticeship in railway service, but it is doubtful if there are any who have had as varied and interesting a career as his. Born at Wilmington, N. C., on January 20, 1880, he rounded out a restricted formal education with an experience that included service in the navy during the Spanish-American War, employment with construction contractors and a venture at contracting on his own account, before entering railway employment as a construction foreman.

Mr. Greenabaum is not one to wait for opportunities to come his way. It has been his rule to make them for himself. When he applied for work on the Rock Island, in 1914, his prospective employer seriously questioned his qualifications and told him bluntly that he would be employed solely because there were no other applicants. Within a few months he superceded the man who had hired him. We are advised on good authority that his entrance into the railway supply industry was not the result of an offer of a position, but came about as a consequence of his own initiative. He had an idea that he wanted to develop and he was given an opportunity to demonstrate the merits of his convictions.

No one who knows Al. Greenabaum would say that his success as a salesman is the result of instruction in the psychology of salesmanship. It must be ascribed instead to a contagious enthusiasm, an unbounded confidence in himself and what he has to sell. Endowed with an adaptability which makes him thoroughly at home with men of all ranks, he has made many friends and takes a pardonable pride in the breadth of his acquaintance. Furthermore, he derives keen pleasure in the renewal of friendships with his associates of past years. It is for this reason that the announcement of his election as president of the N. R. A. A. will be a source of satisfaction to his many friends in the railway and railway supply industries.

Pyle-National Floodlight

FOR SHORT range floodlighting, the Pyle-National Company, Chicago, has developed its Type-10875 AG floodlight which has an 18-in. crystal glass reflector and is designed for a 1,000-watt floodlight lamp. The unit is entirely dust and water tight and also rust-proof. The front door is hinged and drawn down tightly by means of four thumb screws into a groove against a packing of impregnated jute. The thumb screws have a cap at the top to protect the stud threads from the weather. The front door glass has a packing and is held in place by eight brass screws through a one-piece ring. The housing and front door is of cast aluminum alloy, pins and screws are of brass, and where practical only non-corrosive material has been used.



Pyle-National Floodlight Has Several Maintenance Features

Where steel is necessary for reasons of strength, it has been heavily cadmium-plated. By a special construction of the body of the projector, ample area has been obtained for the dissipation of heat, making ventilation unnecessary—another means of excluding dust and water. Lead-in wires are brought in through a strain relief bushing so arranged as to form a seal around the wires.

The reflector is of blown crystal glass, 18 in. in diameter, with a specially-developed composite curve that permits the efficient use of either a G-40 or PS-52, 1,000-watt lamp. A special process covering on the reflector after it is plated protects the silver from oxidiation and heat. A simple positive focusing device has been applied and is so arranged as to be operated from outside the case easily and quickly with one hand. Besides placing the lamp in the focal position, another feature has been embodied in the focusing device, whereby the lamp may be turned so as to have the filament gap always to the outside, a feature that adds more light and uniformity to the beam, it is said.

Position locking devices applied to the base and side swiveling points keep the floodlight always in correct position. When once it is "trained' on the area to be illuminated and the locking device set, the body can then be turned back or sideways for lamp renewal or lens cleaning and again returned to its original position quickly. Readjusting after dark is said never to be necessary.

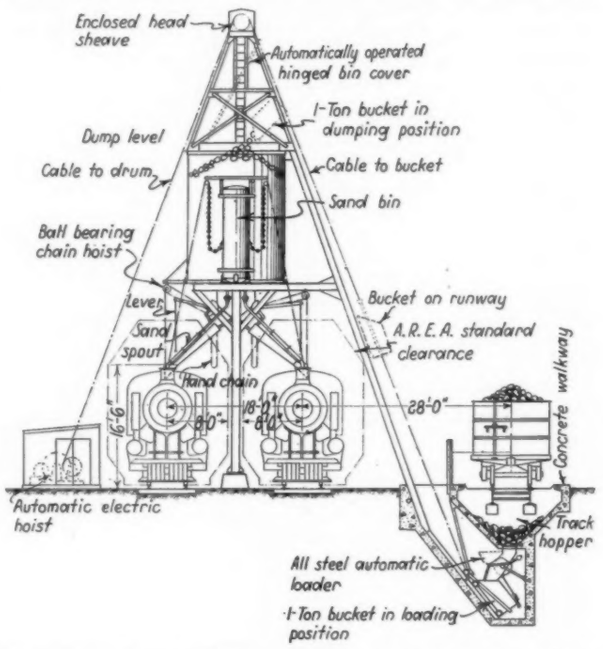
As each floodlighting requirement is a little different, a choice of three lenses is offered. Rectangular divergence lens, No. 1842-S (40 deg. by 14 deg.), gives a rectangular beam of light. Circular divergence lens, No. 1842-CIR, gives a circular beam of light with a 40 deg. spread; and a plain lens, No. 1842-H, gives a circular beam of light with a 20 deg. spread. When light is required on the ground directely in front of the floodlight, a visor can be applied to the front door to deflect the upper stray light downward. A visor also helps to minimize the dirt that collects on the front door glass.

A New Small Capacity Automatic Coaling Plant

AN AUTOMATIC coaling station of simple design has been developed by the Roberts & Schaefer Company, Chicago, for the economical handling of locomotive fuel where the requirements are not large. While the plant is designed for two tracks it can, of course, be installed to serve only one track.

The structure consists of a cylindrical overhead storage bin of 50 tons capacity supported by a column between the tracks and by an inclined runway which also provides a readily accessible track for the one-ton bucket in which the coal is hoisted from the track hopper to the dumping position at the top of the bin at the rate of 35 tons an hour. The runway extends above the top of the bin, this portion forming part of a steel structure supported by the top of the bin so that the runway, together with the column support, forms an A-frame, carrying at its top an enclosed sheave. The hoisting cable from an automatic electric hoist housed on the opposite side of the tracks from the track hopper passes over this sheave, and the load is thus transferred directly downward on the supporting structure.

The track hopper is 20 ft. long and is equipped with an automatic loader for filling the bucket when it returns to its position in the pit so that the operation of the plant is entirely automatic from the time hoisting is started until the power is turned off. Coal is delivered to each of the two tracks through Roberts & Schaefer side-cut non-skim gates which prevent segregation of the coal. If desired, a five-ton dry-sand bin with telescopic delivery spouts may be attached to the side of the structure so that locomotives may be served with sand when they are spotted at the coaling station.

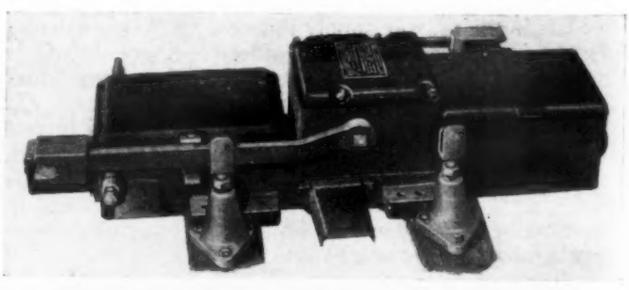


Side Elevation of Roberts & Schaefer Company Small Automatic Coaling Plant

Union Dual-Control Style-M2 Switch Movements

THE Union Switch & Signal Company has developed its dual-control Style-M2 electric switch movement to supply the demand for a combined electric switch and lock movement and dual-control mechanism.

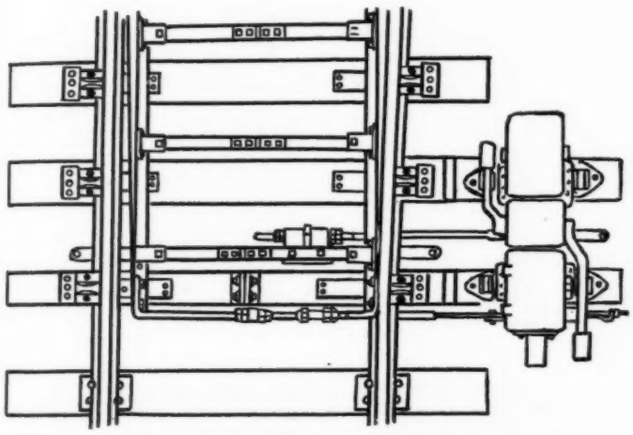
In this mechanism, a simple means is provided in the gear train whereby, by the movement of a selector lever, the main vertical driving shaft may be connected to the train of gears to the motor drive or to another drive for hand operation. The movement of the main drive shaft is exactly the same for both motor and hand operation. As a consequence, the operation of the switch movement, in so far as the operation of the oper-



Union Dual—Control Style M Switch Movement

ating rod, lock rod, locking mechanism and circuit controller are concerned, is the same for both power and hand operation.

The same lock rods and operating rods are used with this switch movement as are used with the standard electric switch and lock movement. No special or auxiliary connections to the switch points are required. The mechanism requires but slightly more ground room than



Union Dual Control Style—M Switch Movement

the standard Style-M2 switch and lock movement, and of course there is not the necessity for the electrical cross connections from one side of the track to the other.

A circuit controller is provided which is actuated by the selector lever so that when the selector lever is moved towards the position for hand operation, the motor circuit is broken, thereby preventing operation of the motor. This circuit controller also provides means for such control of the signals or tower apparatus as may be desired when the selector lever is in position to operate the switch by hand.

The operation of this machine by the trainmen is practically the same as that of the "Union" separate dual-control mechanism. If it is desired to operate the switch by hand, the hand-operating lever should be thrown to the position corresponding with the position of the switch at the time. The selector lever can then be thrown, thereby connecting the main drive shaft to the gearing for hand throw operation. As mentioned above, the throwing of the selector lever opens the motor circuit, thereby making it impossible for the operator or dispatcher to operate the movement by power. When it is desired to restore the movement for power operation, the switch should be thrown by hand to the position in which it was when the change-over to hand operation was made. When the switch is restored to this position, it will be possible to throw the selector lever to its other position, thereby connecting the main shaft to the gear train for motor operation. The motor circuit is again closed and the movement is again under the control of the operator or dispatcher.

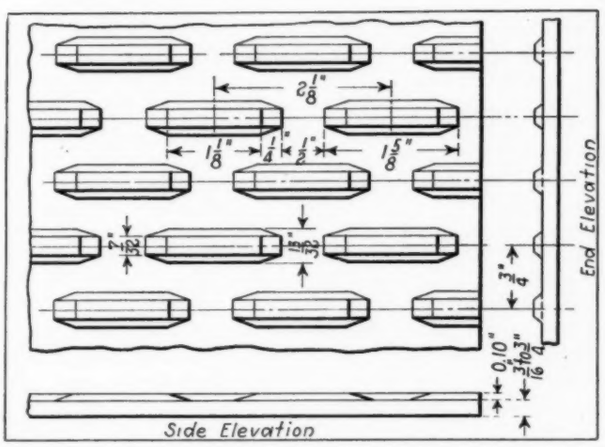
The same four-gear combinations available for the Union Style-M2 movement can be supplied with the new movement. These are for application to: (a) 110-volt a-c. or d-c. single switch or single slip movement; (b) 110-volt a-c. or d-c. frog or double slip movement; (c) Low-voltage single switch, 30 sec. operation; (d) Low-voltage single switch, 16 sec. operation.

A New Steel Safety Floor Plate

THE Illinois Steel Company, Chicago, has designed and placed on the market a new steel floor plate which it has designated as type M-41, for use where protection from wear is desired, together with resistance to slipping by pedestrians, such as on thresholds, stair treads, boiler room floors, or covers for openings in sidewalks or platforms. These plates are provided with bosses and are rolled in various widths and thicknesses, as shown in the accompanying tabulation.

Thickness (Inches)	Width (Inches)	Length (Inches)	Weight per Sq. Ft. (Lb.)
3/16	6 to 66	180	8.8
1/4	6 to 66	240	11.3
5/16	6 to 66	240	13.9
3/8	6 to 66	240	16.4
7/16	6 to 66	240	19.4
1/2	6 to 66	240	21.5
5/8	6 to 66	240	26.6
3/4	6 to 66	240	31.7

The bosses, which run longitudinally with the plates, have rectangular faces, 1⅛ in. long by 7/32 in. wide, with beveled sides and ends. Each line of bosses is spaced ¾ in. center to center, with the adjacent lines, and the bosses are staggered so that the centers on one line fall midway between the centers of the bosses in the lines on either side. This arrangement is said to provide a



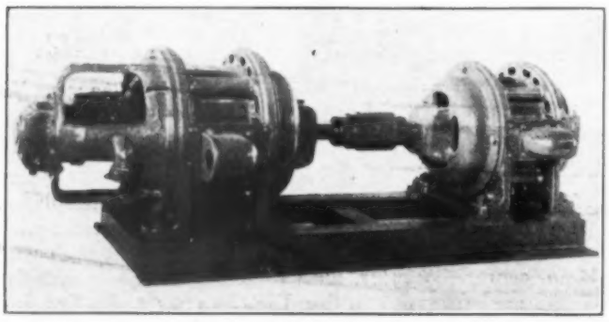
The New Steel Safety Floor Plate

satisfactory surface for walking and at the same time to afford a safe foothold. The plates are also said to shed water completely and to be cleaned easily.

Induction Frequency-Changer Sets for Power Supply

THE POWER for the operation of 100-cycle continuous type automatic train control systems, is usually obtained from frequency converters supplied from commercial power sources of standard frequency. Alternating current 100-cycle generators with direct-connected exciters driven by standard induction motors of a frequency the same as the power source have been considered satisfactory, even though the full load "slip" of the motor brings the output frequency to 98 cycles or below. To keep this output frequency as high as possible, it has been customary to furnish a motor of much larger rated output than actually required for the generator load. For a number of years, the General Electric Company has manufactured induction frequency changers for industrial applications, but

during the past year they have been used also in railway signaling in place of an ordinary frequency converter. An induction frequency changer is essentially a "slip-ring" type of induction motor driven in a direction opposite to that which it would naturally run as a motor. The power input to an induction frequency changer is partly electrical and partly mechanical, being about proportional to the excitation and rotational frequencies. For driving a 60/100-cycle frequency changer, the motor need be



General Electric Frequency-Changer Set for 100-Cycle Train Control Power Supply

only about 40 per cent of the size required to drive an alternator of the same kw. output as the frequency changer.

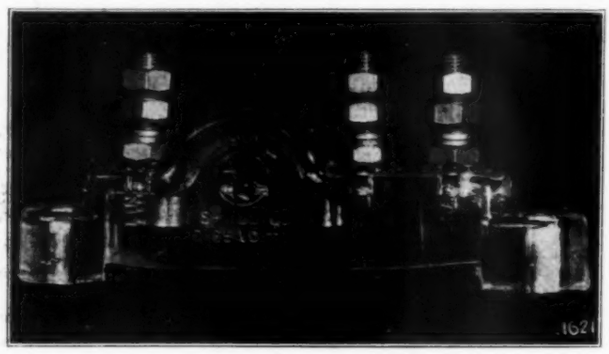
Following is a summary of the advantages claimed for the G.E. motor-driven induction frequency changer over an induction motor-driven frequency converter: (1) Smaller in size, since the motor furnishes only a small part of the total output. No exciter required. (2) Less weight for the above reasons. (3) Less expensive, particularly in the smaller sizes. (4) Output frequency is much higher since the slip of the motor affects only the rotational frequency. (5) There is no more simple machine than the induction motor and these G.E. sets consist essentially of two induction motors. It is said that practically the only maintenance is to keep the machines reasonably clean inside and out and to keep sufficient oil in the bearings. (6) The motor is small and can be thrown directly across the line in starting. (7) Manual adjustment of voltage is secured by changing taps on the transformer.

Westinghouse Low-Voltage Arrester Is Glass-Encased

THE PURPOSE of the "Autovalve" arrester, recently placed on the market by the Westinghouse Electric & Manufacturing Company, is to protect signal apparatus or instruments from damage by over-voltages. Simplicity is the keynote of the construction of this arrester, which consists fundamentally of two small disks separated by a mica washer and held together by two flanged copper springs; one connected to the line and the other to the ground terminal. When the arrester operates, the air gap between these two disks is broken down and the discharge follows in the form of a glow. The speed of operation of the new arrester is said to be exceptionally rapid, being retarded by air resistance only. The operation is inherently rapid because of the absence of any solid dielectric. Since air at atmospheric pressure is the active element there is no deterioration and the characteristics remain unchanged, even after many severe discharges, it is said. Maximum protection is provided by this arrester against dangerously high voltages, because its discharge voltage is low and the delay in its operation is said to be the minimum. The resistance is low; discharge currents of 1,000 amp. may flow through the arrester without causing a dangerous voltage across it.

Ease of inspection is obtained by the use of a clear glass case, through which every part of the arrester can be seen without removing the cement seal in the bottom; also leakage currents have been reduced to the minimum by the use of the moisture-proof glass case. The arrester is 1 in. wide, 6 in. long, and 2½ in. high.

Standard A. R. A. binding posts are used and are plainly marked, "line," "ground" and "load" by raised letters on the glass case. The style number and voltage ratings also appear there. The case, made of high grade glass, is strong. The arrester element is protected from dust, insects and moisture, as the bottom is sealed and the binding posts are



Glass Enclosed Low-Voltage Arrester

fitted with compressible washers. The feet are raised from the rest of the base and the mounting holes are fitted with metal ferrules to prevent breaking of the case by undue tightening of the mounting screws.

Type-C9 Balkite Signal Charger

THE Fansteel Products Company, North Chicago, Ill., has developed a new Balkite rectifier cell, Type-C9, which meets the demand for a charger to operate continuously at rates of 0.5 amp. or less. This Balkite cell is suitable for charging, line, operating, and signal batteries, where the demand is usually much less than 0.5 amp. The Balkite Type-C1 cell is still recommended as the standard for track batteries and for locations where higher charging rates are required. The Balkite Type-C9 cell has a normal operating period of 1,350 a.h. between additions of water. It is 4 in. wide, 6 in. long and 7⅞ in. high overall. The cell is shipped complete with concentrated electrolyte so that it is only necessary for the user to add one quart of water when setting up the cell. This cell will operate in periodic over-load service of several days duration at a rate of 1 amp. without injury to the cell and without overheating.

The Balkite Simplex transformers, Types RS-86 and RS-87, have been designed so that they can be

universally used for the charging of track, line, operating or signal batteries wherever only one battery is to be charged at a location. These transformers are designed for either 115 or 230-volt primary to operate on frequencies of 50 to 100 cycles.

Simplex Transformer

Balkite Charger Type C9

The maximum continuous charging rate is 1 amp. and taps are provided to permit the charging of from 1 to 7 cells (lead battery). The charging rate is adjustable down to 0.150 amp. The transformer is 8⅝ in. high, 4½ in. wide and 6⅛ in. deep overall, with control resistor in place. It is shipped complete with resistance unit when ordered with either Type-C1 or Type-C9 Balkite rectifier cells. This transformer meets the requirements of the proposed Signal Section specification for rectifier transformers.

Type-75 Edison Primary Cell

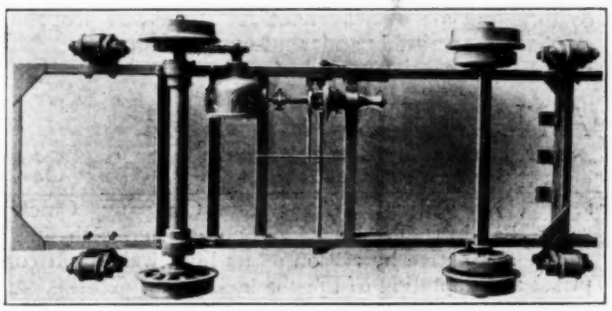
A LOW-CAPACITY caustic soda primary cell has been introduced by Thomas A. Edison, Inc., which is constructed along the same lines as its standard cells of greater ampere-hour capacity. This cell is particularly well suited for signal and telephone work and for other service where uniform voltage and reliability are requisites. In size this new cell, which is designated as Type-75, is slightly larger than a standard No. 6 dry cell, but its capacity is greater. At a continuous discharge of 100 m.a., it will deliver at least 75 a.h. to a cut-off voltage above 0.6. Even at a continuous discharge of 1 amp., it will give in excess of 60 a.h. to a cut-off voltage above 0.5. At intermediate rates of continuous discharge, the results fall in between the two examples cited, and on intermittent discharges the average voltage is always higher.

Edison Type-75 Primary Cell

The Edison Type-75 primary cell is suitable for both open and closed circuit service and is not subject to depreciation when standing on open circuit for a long period. It is claimed also that it will maintain a constant voltage, even when subjected to comparatively heavy continuous discharge rates. The new cell is easy to make up and when renewal is necessary the entire unit may be discarded and replaced with a new one at a cost which it is claimed in much less in the long run than the cost of equivalent dry cells.

New Self-Propelled Compressors

THE Chicago Pneumatic Tool Company, New York, has developed a new line of self-propelled gasoline engine-driven compressors for railway construction and maintenance work. These machines, which are designed to meet the requirements for air compressors in both the track and bridge and building departments, where portability is an essential factor, consist of the standard Chicago-Pneumatic portable compressor units, set on a structural steel frame which is mounted on flanged wheel for movement on the tracks. The new machines are built in sizes of 100, 160, 220 and 310 cu. ft. per minute displacement, and range in weight of 6,350 lb. to 10,700 lb. In order to facilitate their movement on the track, the carrying wheels run on Timken roller bearings, the use of which, it is said, to make it possible to start the largest car rolling along the level track, with one hand. For moving the units from one track to another, or for setting it off along the right-of-way, each unit is equipped with flanged transverse rollers, mounted in air-operated lifting jacks, and a transverse towing winch which is provided which makes it possible for one man to shift the compressor car from one track to another in a minimum of time.

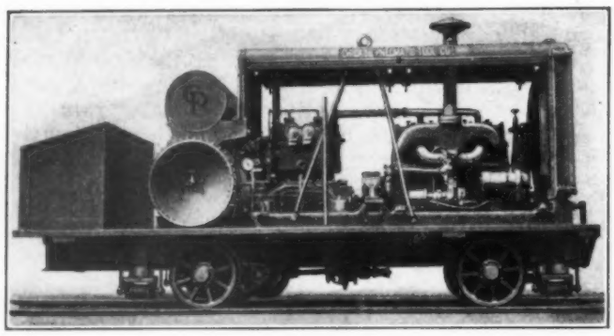


Bottom View of the Frame, Showing the Transverse Rollers, the Tractor Type Brakes and the Driving Mechanism

The compressor unit includes the same special features embodied in the industrial Chicago-Pneumatic

portable compressors, including simplate valves, an auto-pneumatic throttle which slows down the engine when the compressor unloads, a sectionalized radiator protected by stout steel bars, and a quickly detachable flexible coupling between the compressor and the engine. The self-propelling mechanism embodies a powerful two-wheel chain drive which propels the car at speeds of from 12 to 18 miles an hour.

Special equipment forming a part of the new compressors, includes a locomotive lifting bale, a large equipment box, wood platforms which extend over the wheels on each side, and trailer-type drum brakes fitted

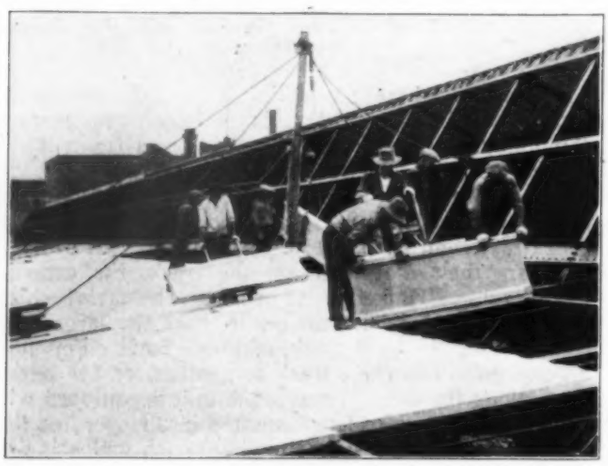


One of the New C. P. Self-Propelled Air Compressor Units

to the two front wheels. The compressor, the engine, and all of the accessories are mounted rigidly on a one-piece cast steel frame, the more important units being housed within a heavy metal case to protect them against the weather and damage when not in use. These compressors are also available with the self-propelling mechanism omitted, and skid-mounted machines with lifting bales can be furnished if desired.

A New Light-Weight Concrete Roof Slab

THE Federal Cement Tile Company, Chicago, has introduced a new concrete roof slab that is distinctive by reason of its light weight. It comprises an adaptation of the channel type which this company has applied extensively to spans of a greater

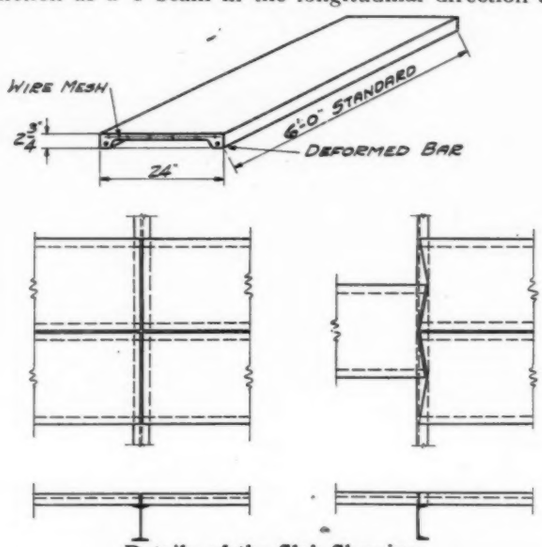


The New Roof Slabs Are Easily Handled

length than that for which the new slab is designed.

Previous to the introduction of the new roof unit, the standard Federal roof slabs for use with composition covering, comprised flat slabs designed for use on roofs having a maximum purlin spacing of six feet and channel-shaped slabs for use where the purlin spacing ranged about six feet to a maximum of eight feet. The flat slabs weigh 19 lb. per sq. ft. for use on spans up to five feet and 22 lb. for use on spans up to six feet. The standard channel slabs for the eight-foot maximum span also weigh 22 lb. per sq. ft. However, investigation indicated that greater economy in roof construction can be obtained in cases where the economical spacing of purlins ranges from 5 ft. to 6 ft. 6 in. by the development of a channel type of slab designed especially for this particular range of span lengths.

The new channel slab conforms in outline and detail to the channel slabs for longer spans except that it is lighter, weighing only 16 lb. per sq. ft. The section is 24 in. wide and has a thickness of 1⅛ in. in the pan and 2¾ in. over all at the ribs. The standard or stock length is 6 ft., but it may be had in lengths up to 6½ ft. or in any shorter lengths desired. It is designed to function as a T-beam in the longitudinal direction and



Details of the Slab Showing Also Manner of Erecting on I-Beam and Channel Purlins at the Lower Left and Right Respectively

is reinforced with wire mesh in the pan for the transverse span between the ribs.

The slabs are laid with square butt joints on I-beams or other purlins affording an equal bearing width. Where channels are used as purlins and the bearing width is not sufficient for adequate support of the two slabs of the adjacent spans, the slabs are furnished with dove-tail ends and are laid in staggered formation as shown in the sketch. The slabs are designed for a safe live load of 60 lb. per sq. ft. for the maximum span of 6½ ft. on the basis of a factor of safety of four as determined from the results of tests to destruction.

Albert Fink, Creator of the Fink Truss

Courtesy Louisville & Nashville